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MONTHLY

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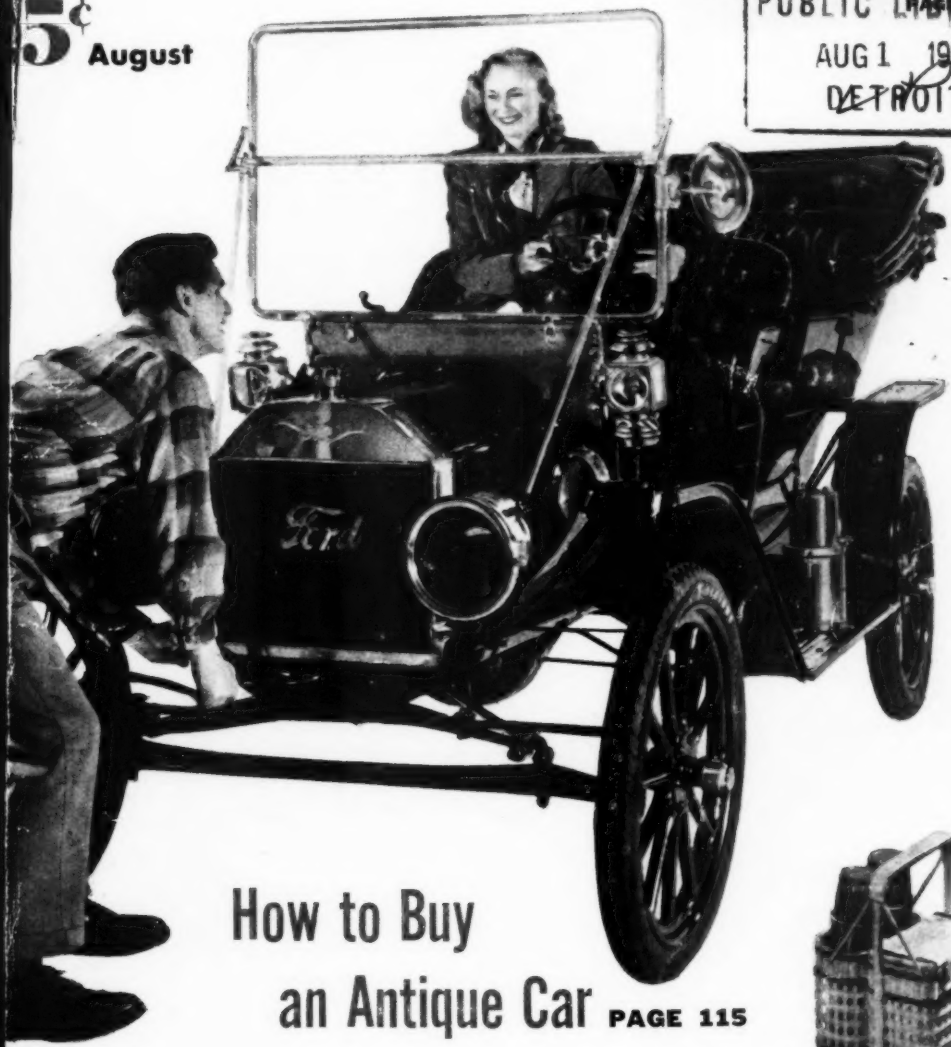

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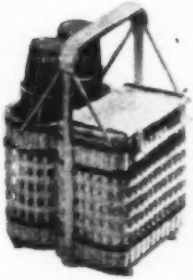

A HOLE IN THE HEAD —

We once knew a guy who liked to go gunning — just like a lot of other guys we know. He wasn't tight — tho' he thought a lot of a buck, but every time he went gunning he had less game to show for it, also less dough for the bank. Even so, when he sneaked out on his wife for a trip in the brush, he figured he'd square things with her if he came home with a full bag. His only trouble was that he never bagged anything worth mentioning and believe me he spent plenty trying. One day he got smart after reading our free book, and he took his favorite "Old Betsy" out behind the barn and gave her a workout, just like the book said. *Was he surprised?* His wife figured he had a hole in the head and he thought "Old Betsy" had one in hers. But he found out, behind the barn, that his wife must have been right about him, because nothing right came out of the head of "Old Betsy". Her patterns were lousy! *What patterns . . . ?* Why — the patterns "Old Betsy" was shooting. Just like the book said, he'd tacked some papers on the back of the barn and shot them full of holes and when he looked at the holes in the paper, *they were all in the wrong places!* So then he decided to fix up some of the holes — in the head anyway. He sent us "Old Betsy" and we put a POLY-CHOKE on her . . . at the hole end. And, in a few days, when he got her back, he took her out behind the barn again, and gave her another workout — on paper. *Was he surprised!* Wow! — all the holes were in the right places. Instead of shooting like a gas pipe, "Old Betsy" was really delivering good patterns. Next day, he sneaks out on his wife, and goes hunting. *What happens?* . . . He can't miss! For the first time in his life he brings home a full bag of game. *Is he tickled?* . . . Sure, "Old Betsy's" new patterns got birds and saved plenty of ammunition . . . (bucks, that is, at today's prices). Now, when his wife sees the game, she thinks he's fixed the hole in his head. He figures he's fixed up the hole in "Old Betsy's" head — he has more fun than he ever had before, and he's got a few bucks for the bank . . . enough to pay for the POLY-CHOKE and some ammunition anyway.

E. Field White,
Pres. Poly-Choke Co., Inc.

P.S.*

*POLY-CHOKE SAVES!

If your Old Betsy is a "single" with a hole in the head and doesn't seem to act just right, send her barrel to us and we'll put a Poly-Choke on her. Anyway, mail us the coupon and get the *Free Booklet*. It should save you a few bucks.

The Poly-Choke Co., Inc., 578 Tunxis St., Hartford 1, Conn.

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Stop TV Interference At Once And Stop It—For Good!

An amazing no-risk challenge to every set owner who is tired of paying $5-$10-$15 for THE SAME TV REPAIRS . . . OVER AND OVER AGAIN!

Do you know that 95% of the wavy lines, streaks, zags, distortions, picture roll, flutters, and snow that ruins your TV viewing are not caused by your set at all? That they cannot be eliminated by your repairman, no matter how good he is! That they cannot be prevented by your antenna, no matter how powerful it is!

Yes, 95% of your costly television troubles are caused by electronic TV interference from the outside. And the only way to permanently remove that interference is to BLOCK IT OUT, before it even reaches your set—in exactly the same way sunlight glare is blocked out by sun glasses, before it reaches your eyes.

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WAVY LINES — Caused by airplane flying as much as 15 miles away from your home. MR. OSCAR HOLDEN of *New York City* writes: "My TELERON WAVE TRAP eliminates 95% of all wavy lines within 15 minutes after I clipped it on my set."

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Mechanics and Handicraft

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Gold Cup racer Guy Lombardo—he also leads a dance band—tells what it takes to own and drive a boat with the temperament of a ballet dancer, the power of an airplane and the speed of a racing car. For the story of this exclusive sport, turn to page 88.

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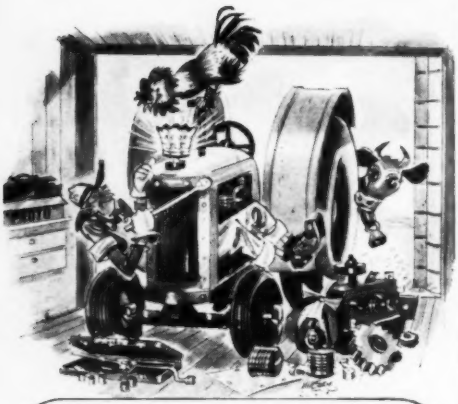

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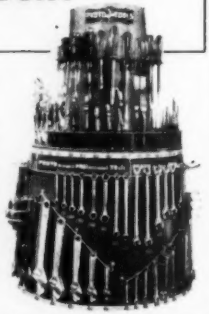

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NEXT MONTH . . .

How Experts Snap Ball Games

Ace news photographers will be in the stands to bring you action shots from all parts of the field when the World Series is played. How they'll get their pictures, what kind of cameras they'll use and what camera angles are best all will be described in next month's issue.

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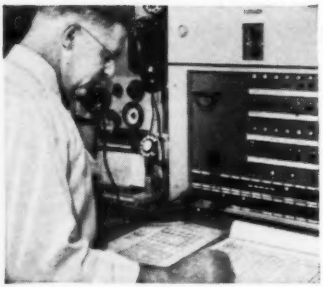

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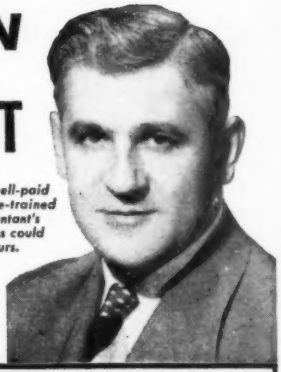

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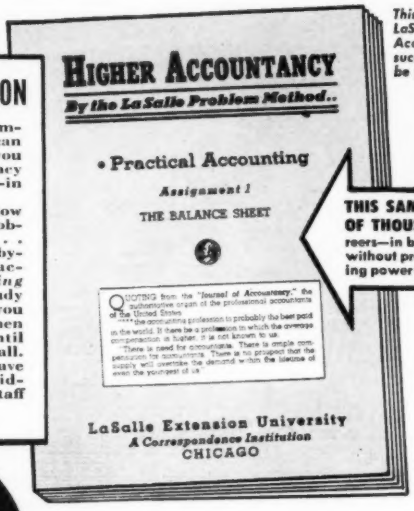

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The personalities, voices, and faces of well-known men and women are now—through television—a part of daily life in 16 million homes.

Celebrities come calling on them every day!

Few of us, until recently, ever came face-to-face with celebrities or shared—as eye-witnesses—in events of national interest. But now, in homes everywhere, we are "visited" daily by great artists, entertainers, statesmen.

Television, with its timely, pictorial coverage, brings us news, sports, and world events *as they happen*. Its spreading networks are a rich source of entertainment to more and more people.

RCA, through its research and engineering, has contributed heavily to the advance of television—just as it did in radio broadcasting and world-wide radio communications. Among the major RCA advances have been: the universally used image orthicon television camera, the kinescope picture tube... and now, the new RCA Victor super TV sets with "Picture Power"—for the clearest reception possible, wherever you live.

See the latest in radio, television, and electronics at RCA Exhibition Hall, 36 West 49th St., N. Y. Admission is free. Radio Corporation of America, RCA Building, Radio City, New York 20, New York.

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"How to Become a Mail Order Millionaire"

Read how Gilbert on a "peanut" investment built up to $350.00 A DAY. Learn how Zimmerman started a mail order business on a buck private's pay and spiraled $16.80 into a big yearly income. See how a Chicago clerk quit a $75.00 job and now makes $22,000 a year in his own Mail Order business. Read how a southern boy made a fortune selling war-surplus parachutes which he bought as he went along. All Free! Send name on coupon for a copy of this fascinating reprint of "How to Become a Mail Order Millionaire" from Mechanix Illustrated plus details on the L.W. Mail Order Survey.

Start on a SHOESTRING!

The real-life stories of success in Mail Order read like fairy tales. If I had not personally known these people their stories would be hard to believe. Yet they are not only true, but they represent just a few of the hundreds of "little operators" who have been swept into big money by Mail Order.

GAINES. I personally guided his start when he invented an automatic pants presser. He started with one little ad in one magazine. Four years later he retired — with enough real estate to keep him in cash income the rest of his life.

VAN MARK. I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start—ended up six years later with savings of $50,000 and an income of $5000.00 a year for life without further work.

DUGGAN. A few years ago he was a truck driver. Started fooling with Mail Order in a spare room in his spare time. Last year he said, "I don't know how much I'm worth—after you get the first million you quit keeping track."

MRS. NIXON. Started a small Mail Order business at home—just to keep occupied. It looked good and she came to me for advice. I showed her how to expand. In two years the business got so big her husband resigned his job to help manage it.

FOXMAN. Foxman worked as a hack writer at $70 a week. He had idle time in the evenings—ran an ad offering something he didn't have—got so many orders he had to find a source of supply. He made $18,000 the first year. He gives me credit for "showing the way."

JORGENSON. Consulted me about a specialty product. On my advice he ran one ad to "test" its saleability. That ad brought sales of $50,000. In his first year he did a business of nearly a half million dollars. His original investment was less than a thousand.

These things I have seen. These people I have helped to the realization of their dreams — these and hundreds of others. My own fortune was made in Mail Order. And now my secrets can be yours.

L. W.

Have you ever thought of running a profitable little sideline right from your home? Has it occurred to you that *you are just as capable as anyone else* of making money on a product or service that can be sold by mail? Have you ever looked into the Mail Order business as it's run (on tiny investments) by innumerable small operators?

Forget about Sears and Ward's! *Read about the "little fellows"* . . . clerks, teachers, vets, mechanics, salesmen and others . . . who are packing Mail Order items in bedrooms, spare rooms, attics, garages, cellars . . . dumping them in the Post Office . . . and quietly banking the fistful of Money Orders, cash and checks delivered to them daily by the mailman.

An annual business of almost a billion dollars is done by "little fellows" who advertise and sell *just one item!* The Department of Commerce of the United States says, "A number of the most successful obtain incomes as high as $40,000 to $50,000.00."

It's an incredible story . . . a story of a business that's wide-open for newcomers . . . with opportunities for income far-and-away greater than you can ordinarily hope to attain by holding down a job. And in Mail Order you can stay as small as you wish—run your deal as a $50 or $75 weekly sideline—or consider jacking it up into really big figures as a full time operation.

Glance at the examples at left. *These true stories are far from unusual.* Multiply them by the hundreds and you begin to get an idea of what can be done . . . what *is* being done . . . in the phenomenal Mail Order field.

* * *

Yet, if you were to jump blindly into Mail Order your chances would be slim. A peculiar brand of "know-how" is vital in this little - known, little - understood business. *This is fortunate for you.* If any Tom, Dick, or Harry would "click" in Mail Order, the field would have been overloaded years ago.

But now you have the opportunity to learn the authentic secrets of successful Mail Order operation. They are revealed for the first time, step by step, in an extraordinary new Survey . . . *the L.W. Confidential Mail Order Letters.*

This Survey is not a course—not a book—not a group of lessons. It is a simple guide that anyone can follow. It shows you how to pick the right product for Mail Order. It shows you exactly how to start a profitable business *fast*, with cash or Money Orders in the envelopes you receive. It shows how to buy your product out of the very money you get in the mail, so you don't have to tie up cash in large supplies of your product. It gives you actual examples of ads and letters, *analyzed to show how and why they make money.* It demonstrates the months to start, the time to expand, the best way to get prospects' names. It reveals from A to Z the confidential facts that have made fortunes for Mail Order operators who use them.

Mail the coupon today, or simply send your name and address on a postcard. No salesman will call. We will mail, postage prepaid, a *Free* copy of "How to Become a Mail Order Millionaire" and along with it will give you complete facts about the L.W. Mail Order Survey. Read the facts. Then decide whether you would like to spend spare time or full time in a profitable, fascinating Mail Order enterprise. If you think you would like to follow the footsteps of hundreds of others who are now making good money in this way, you can get your L.W. Survey and begin at once.

Please don't decide to write us "a little later." Send your name *now*, before you forget. This one little act might be the first step to a future of independence and wealth.

The L. W. MAIL ORDER SURVEY, Dept. 38
7070 N. CLARK ST., CHICAGO 26, ILL.

The L. W. MAIL ORDER SURVEY, Dept. 38
7070 N. CLARK ST., CHICAGO 26, ILL.

Mail me a free copy of "How to Become a Mail Order Millionaire" and details about the L. W. SURVEY. It is understood there is no charge at any time, and that I am not under the slightest obligation. After reading, I will decide whether I want to use the L. W. Confidential Letters to help me start a Mail Order business at home.

NAME.....

ADDRESS.....

CITY.....ZONE.....STATE.....

WHAT SECRET POWER DID THIS MAN POSSESS?

Benjamin Franklin
(A Rosicrucian)

WHY was this man great? How does anyone—man or woman—achieve greatness? Is it not by mastery of the powers within ourselves?

Know the mysterious world within you! Attune yourself to the wisdom of the ages! Grasp the inner power of your mind! Learn the secrets of a full and peaceful life! Benjamin Franklin—like many other learned and great men and women—was a Rosicrucian. The Rosicrucians (NOT a religious organization) first came to America in 1694. Today, headquarters of the Rosicrucians send over seven million pieces of mail annually to all parts of the world.

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I send you parts to build this transmitter

As part of my Communications Course you build this low power broadcasting transmitter, learn how to put a station "on the air," perform procedures demanded of Broadcast Station operators, make many tests.

You Practice Radio SERVICING

on this modern radio you build with parts I send

As part of my Servicing Course, I send you the speaker, tubes, chassis, transformer, loop antenna, EVERYTHING you need to build this modern, powerful Radio Receiver! I also send parts to build many other Radio circuits. You use equipment for practical experience and to earn EXTRA money in spare time.

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Television is TODAY'S Good Job Maker

In 1950, over 5,000,000 TV sets sold. By 1954, 25,000,000 TV sets estimated. Over 100 TV Stations now operating. Authorities predict 1,000 TV Stations. This means more jobs, good pay for qualified men all over the United States and Canada.

Many Make $10 Extra a Week in Spare Time

Keep your job while training. Hundreds of successful RADIO-TELEVISION TECHNICIANS I trained had no previous experience, some only a grammar school education. Learn Radio-Television principles from illustrated lessons. Get PRACTICAL EXPERIENCE—build valuable multitester—experiment with circuits common to Radio and Television. Keep all equipment. Many students make $5, $10 extra a week fixing neighbors' Radios in spare time. SPECIAL BOOKLETS start teaching you the day you enroll.

Send Now For 2 Books FREE—Mail Coupon

Send now for my FREE DOUBLE OFFER. You get actual Servicing lesson to show you how you learn at home. Also my 64-page book, "How to Be a Success in Radio-Television." Read what my graduates are doing, earning; see equipment you practice with at home. Send coupon in envelope or paste on postal. J. E. SMITH, President, Dept. 2HB, National Radio Institute, Washington 9, D. C. Our 38th Year.

I TRAINED THESE MEN

"I have been operating my own Servicing business. In two years I did $14,000 worth of business; net profit $6,850. Have one full time employee, an NRI student."—PHILLIP G. BROGAN, Louisville, Ky.

"Four years ago, I was a bookkeeper, with a hand-to-mouth salary. Now I am a Radio Engineer with a key station of the American Broadcasting Company network."—NORMAN H. WARD, Ridgefield Park, New Jersey.

"When halfway through the NRI course, I made $5 to $8 a week fixing sets in my spare time. Am now selling and installing Television sets and antennas."—E. J. STREITENBERGER, New Boston, O.

"My first job was operator with KDLR, obtained for me by your Graduate Service Dept. I am now Chief Engineer of Police Radio Station WQOX. I never hesitate to endorse NRI."—T. S. NORTON, Hamilton, Ohio.

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Letters

It'll Cost Two Purples and One Pink

If Mr. Herbert Fey of Texas would take a trip to Canada, he'd find just the different-colored money he asked for in your "I'd Like to See Them Make" on page 139 of the May issue.

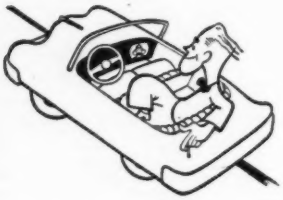
We have green one-dollar bills, orange two-dollar bills, blue five-dollar bills, etc., and he's right—you'd have to be color blind to hand out the wrong one.

F/S J. W. Cowell, RCAF
Lachine, Que.

Cars That Can't Collide

Eighty years from now we won't need the collision-proof cars predicted by Hugo Gernsback in your May issue [p. 82]—there won't be any collisions.

Cars will follow a metal strip in the center of the road that will send out UUHF (ultra-ultra-high-frequency) radio waves to actuate control units in the cars. The strip will steer the cars, raise or lower their power according to hills and curves, and keep them all at the same speed, so that one car will not be able to overtake another and collisions will be impossible.



Other frequencies on the strip will carry radio-telephone and television signals, so you can talk to anybody in the country or just sit back and watch TV programs.

Maj. Bert J. Decker, USAF
APO 11, New York City.

No Camera Stunt

In your story on the Great Northern's giant electric locomotive [June '52, p. 143], the pictures show the engine running with both pantographs raised.

All the electric engines I've ever seen run with only one pantograph at a time, and this is always the rear one. Does the GN loco need both, or was this just a stunt for the camera?

Richard R. Hunt, Danbury, Conn.

You're right that most electric locomotives run with only the rear pantograph. This is because the front one, if it were used and became damaged, would be likely to sweep back and foul the rear one, too, leaving the engine completely powerless.

But the Great Northern's engine is so long and the power draw so great that it uses both pantographs to distribute the load better and insure a smooth, constant contact with the trolley wire.

And if you were to take a ride on the Chicago, Milwaukee, St. Paul and Pacific, you'd see one of the few railroads in the country that commonly use the forward pantograph instead of the rear one. Most of the Milwaukee engines are so long [above] that the rear pantograph would be too far back for the engineer to see and hear it.

Safeguarding Tractors

On page 14 of the June issue you have a letter concerning the danger of farm tractors tipping over backward when power is suddenly applied on a steep grade.

Wouldn't this danger be eliminated if you connected the load to a point near the front of the tractor, instead of the rear, and used front-wheel drive?

Ralph E. Rogers, Charlestown, Mass.

. . . Why not rig a pair of legs extending behind the tractor between the drive wheels just short of touching the ground? If the tractor started to go over, they would form

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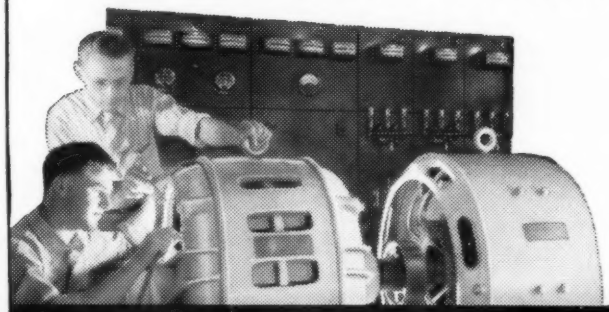

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AND TELEVISION-RADIO

On Real:

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(Frequency Modulation)
RECORD CHANGERS
AUTO RADIOS
PUBLIC ADDRESS Systems

(Right—Instructor helping students check the wiring and trace circuits of television receivers.)

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NAME .....

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CITY.....STATE.....

a brace against the ground to stop it.
SGT. B. J. DOWLING, USAF

. . . I'm just a city slicker whose only farm knowledge is the ability to tell a horse from a tractor on most clear days. But wouldn't front-wheel drive solve it?
G. SHIFRIN, Ann Arbor, Mich.

. . . Extend the drawbar so that the hitch point is behind the drive wheels. Then when the tractor starts to rear up, the wheels become a fulcrum and the load acts as counterweight to help keep it from going over.
HAROLD HUNTER, Vancouver, B.C.

. . . Mount vertical and horizontal guards on the top and sides of the tractor so that it would not pin the driver beneath it.
GEORGE GARBER, Roxbury, Mass.

Keeping Peace Between Planets

Being firmly convinced that flying saucers from a neighboring planet are visiting us periodically to observe us, I am fearful, not of the saucers themselves, but of the panic reaction if one should attempt to land. I'm sure the mob instinct would be to destroy it at once without attempting to meet and talk with the visitors.

To avert such a breach of interplanetary diplomacy, we should set aside a special area to receive space visitors peacefully.
ALFRED JENKINS, New York City.

Slow Trip to the Moon

What delayed that radio signal from Cedar Rapids to the moon and back to Washington [June '52, p. 102] that it took 2½ minutes. Did it stop to play with a star?
W. K. KEARSLEY, Mount Dora, Fla.

No, it was slowed up while passing through a PSM typewriter, which wrote minutes instead of seconds.

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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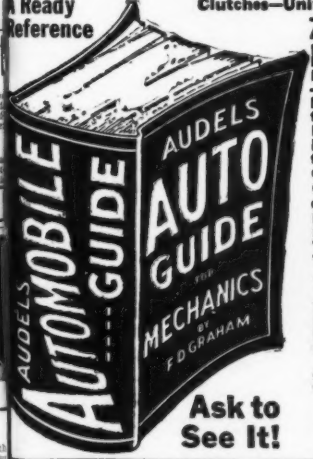

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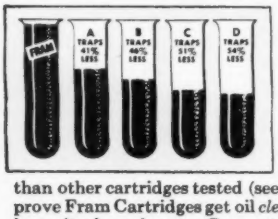

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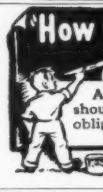

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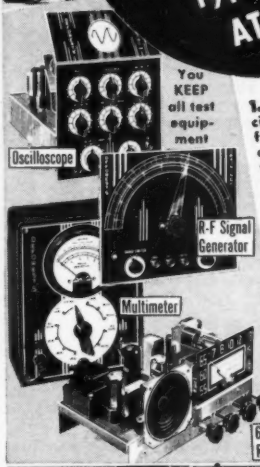

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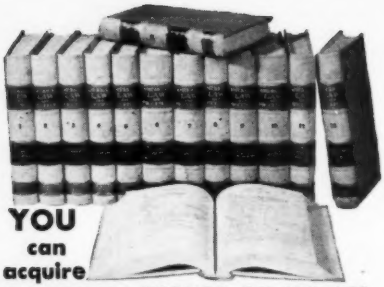

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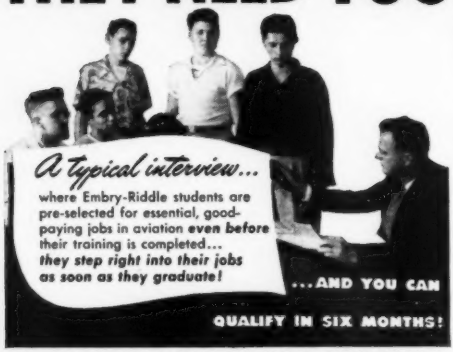

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700-16	6.48	710-15	5.88	750-17	16.68	825-20	18.38
750-16	9.78	760-15	6.08	750-15	19.08	900-20	17.28
525-18	5.08	800-15	6.58	825-15	22.18	1000-20	17.88
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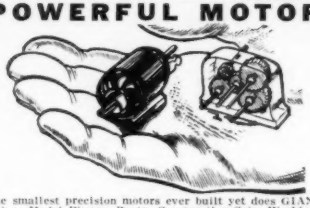

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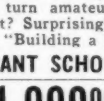

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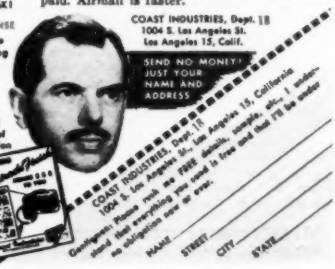

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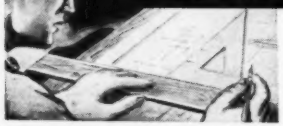

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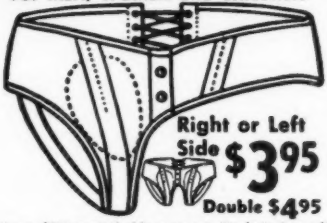

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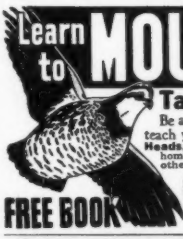

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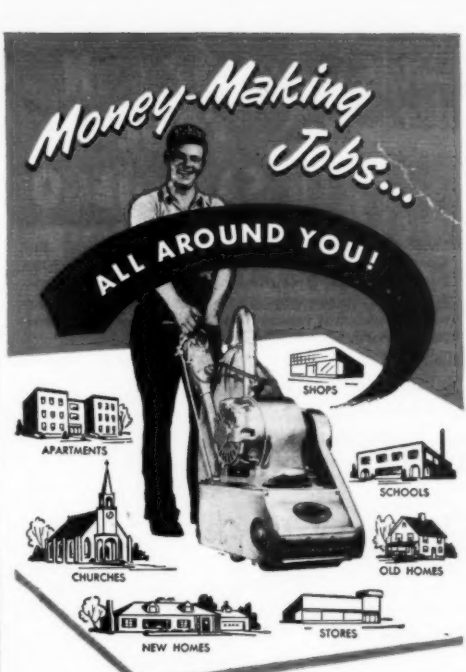

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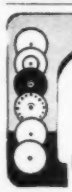

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750-16	7.55	760-15	6.45	750-15	14.05	900-20	18.75
525-18	5.75	800-15	6.75	825-15	16.05	1000-20	19.75
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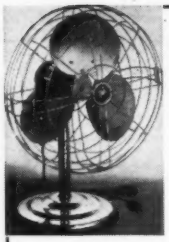

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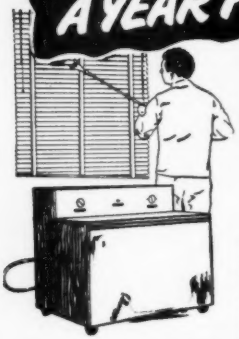

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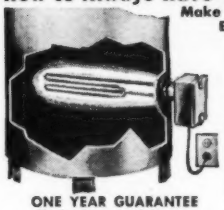

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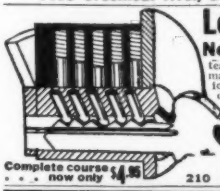

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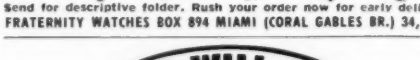

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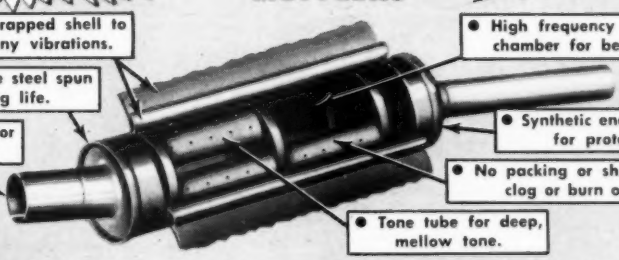

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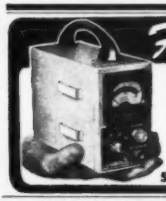

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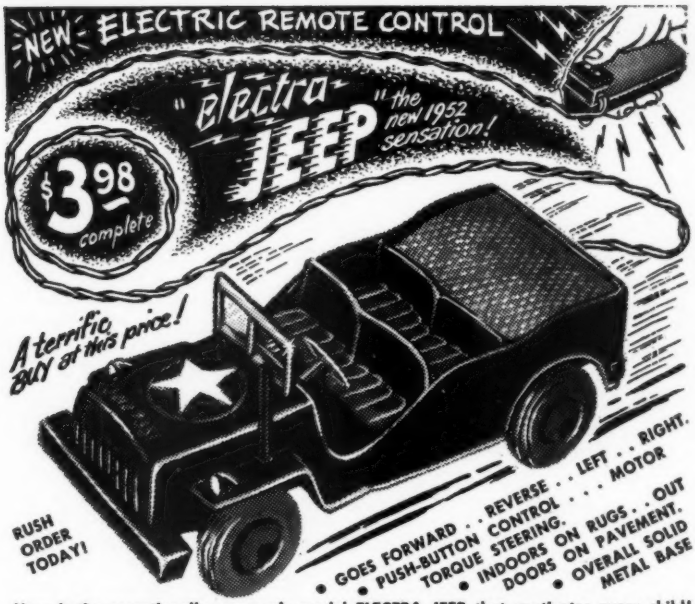

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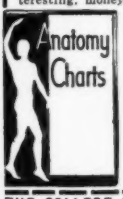

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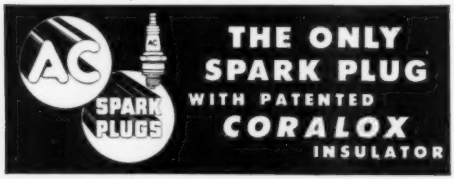

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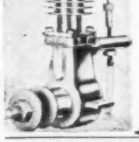

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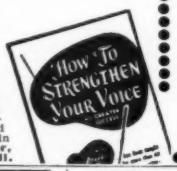

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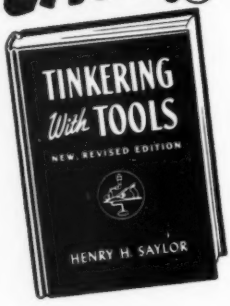

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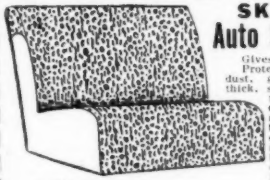

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NEW Idea Chemical and Apparatus Outfits for Home Experimenting, Photo-Scales, Microscopes, Chemicals, Biological and Laboratory Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn, 124-B West 23rd Street, New York 11, N. Y.

SPECTROSCOPE for quick chemical analysis $3.00. Cutting Sons, Los Altos, Calif.

AMATEUR Chemists—If you have your own lab, write for free copy of our monthly paper, The Amateur Chemist, Westwood, Lassen County, California.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology, 10c. Tracey Laboratories, Evanston, Illinois.

BRAND New, spectacular chemical and fireworks experiments manual. Complete set-ups and instructions $1.00. Chemi-Technix Laboratories, 568 Riley Street, Buffalo 8, New York.

CHEMICALS and apparatus for industrial, analytical, and private laboratories. Catalog 20c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N.Y.

AMAZING New Book of Science. Experiments, Formulas and catalogue of Laboratory Supplies. Only 25c; National Scientific Co., Dept. 15, 2204 W. North Ave., Chicago 47, Illinois.

42 HELP WANTED

FOREIGN & Latin American Employment 1952 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply, application forms. Hot List Firms Hiring. $1.00 post-paid. Global Reports, P.O. Box 883-S, Hollywood 28, Calif.

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FAST sellers. Big demand. Catalog. Parker Drug Co., Hoboken 6, New Jersey.

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QUICK Extra Cash! Sell America's outstanding line of Christmas box assortments and personalized lines . . . Plus hundreds of extra profit items. Monogram playing cards, wedding invitations, gift items, deluxe album of exclusive cards, nylon hosiery. Write today for 60 free samples in six beautiful portfolios. Gift catalog included. Elmcraft Chicago, Dept. 9, 5930 So. Western Ave., Chicago 36, Ill.

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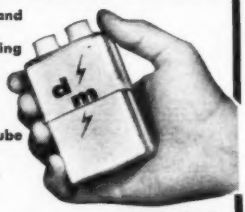

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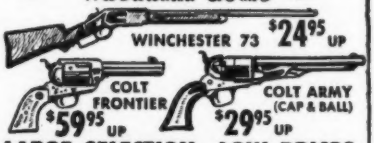

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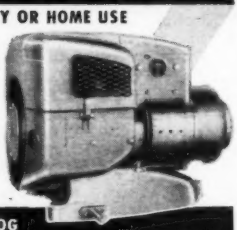

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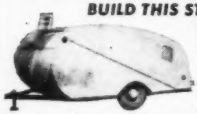

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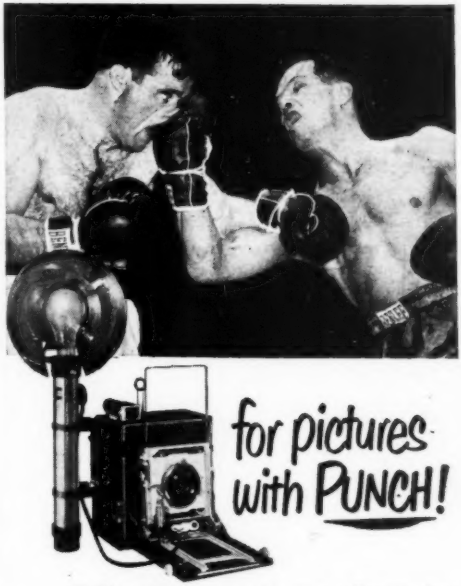

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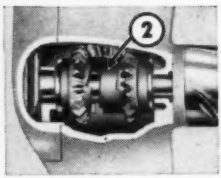

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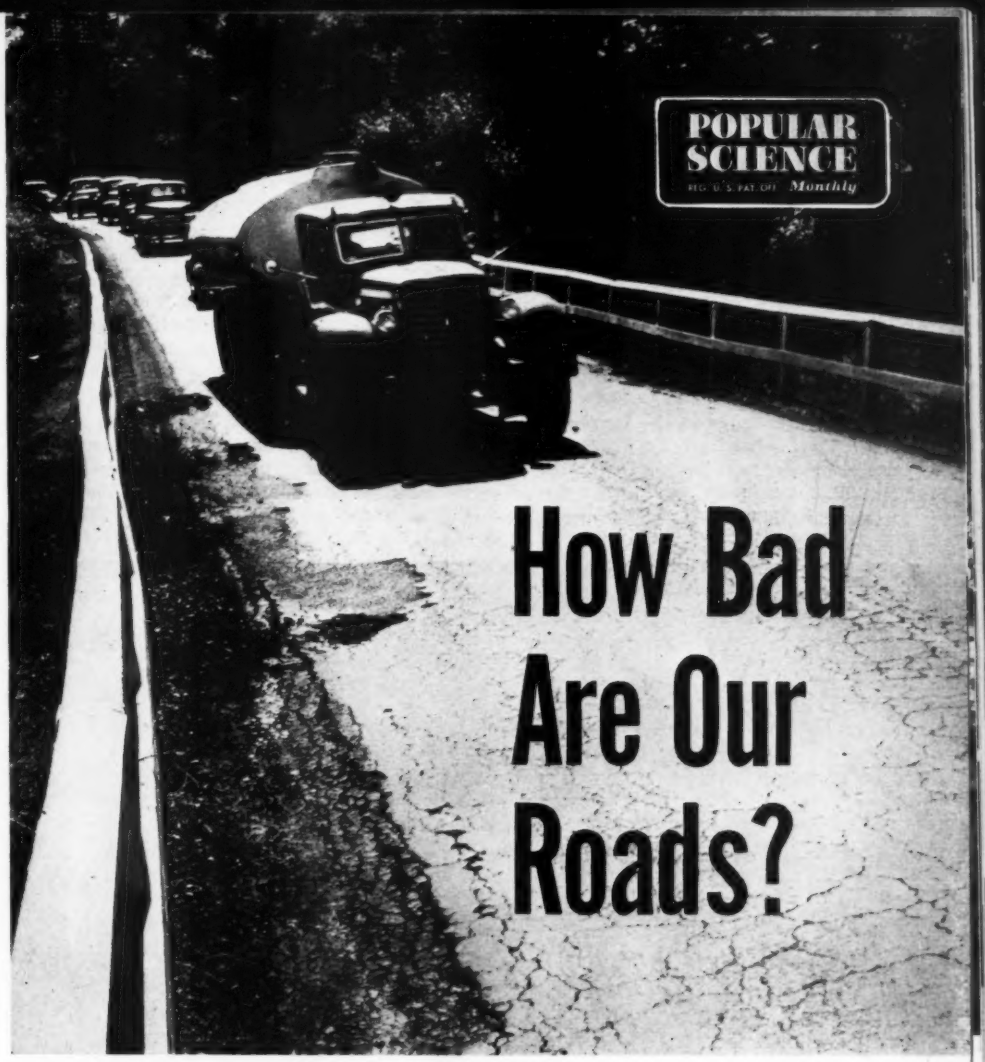


How Bad Are Our Roads?

They're in terrible shape and getting worse. To fix them up will take 15 years and 60 billion dollars.

By Martin Loveland

AMERICAN taxpayers have laid out 50 billion dollars for roads in the last 25 years. But we have only a trifle more than 2,200 miles of first-class, fully modern, non-toll highways to show for our money.

Most of the other 740,000 miles of pavement that we have paid for since the Twenties are now too narrow, too sharply curved, too steep, too nearly shoulderless, too often crisscrossed with intersecting routes and railroad tracks, or becoming too crumbly for the traffic burden they must bear. This year 52,000,000 passenger cars, trucks and buses are traveling the highways. And they are pounding those expensive pavements to pieces.

Even the men whose job it is to estimate how many more vehicles are going to be on the roads each successive year—and who used to be remarkably accurate—did not anticipate any such traffic before 1960.

The tragic combination of an out-of-date,

aging road system and this nationwide stream of traffic is costing billions a year in time lost, perishable goods wasted, property wrecked in accidents. It is causing thousands of unnecessary deaths.

Roads Are 94-Percent Inadequate

Engineers and road officials figure that it will cost us at least $4,000,000,000 a year for 15 years to bring the whole highway network up to snuff. We are now spending $2,700,000,000 a year on construction, but we are falling far short of even keeping abreast of the highway needs, to say nothing of making up for the lags in road building that set us back during the depression and the war.

The most pressing job is that of modernizing the 40,000 miles of highway that constitute the official interstate system—the main roads of the United States. Ninety-four percent of this network, of the greatest importance in both peace and war, is inadequate, according to standards established by the Bureau of Public Roads and all the state highway departments of the country. (Drawings on the next page show what an adequate road is, in the opinion of these experts.)

No one is suggesting that all our principal highways should be rebuilt. Mere widening would put 8,600 miles of them in A-1 shape, according to Thomas H. MacDonald, Commissioner of Public Roads. Minor relocation—largely a matter of lessening curves and reducing grades without touching the straightaways—would make another 14,000 miles first-class, he says. About 12,000 miles

Here's What Ails Our Highways . . .

ONLY SIX PERCENT OF OUR MAIN ROADS ARE GOOD

INADEQUATE — GOOD

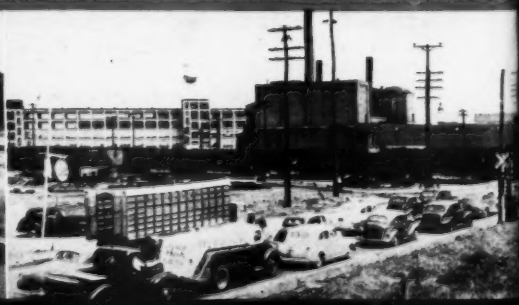
40,000 MILES OF U. S. MAIN HIGHWAY

THIS CURVE IS A KILLER. It murdered three people within a few weeks. It is too sharp, and its shoulder is too narrow. About 15,000 curves on main highways have similar faults.

DOUBLE TROUBLE put the truck at left above into the ditch. The road, like half the rural mileage in the interstate highway system, is too narrow. Moreover, it has no shoulders at all.

CROSS TRAFFIC shouldn't be allowed to interrupt the heavy flow of cars on the four-lane road below. Furthermore, the road, like 1,350 miles of U.S. main routes, ought to be divided.

STALLED BY A TRAIN, the line of cars below should be able to go under it or over it. More than 700 grade crossings like this still add to hazards and delays on interstate highways.



of main road, or somewhat less than a third of the total, should be brand-new.

Of the 12,000 miles of totally new highways that are needed now, more than 2,000 miles would cross large cities, where some of the nation's knottiest traffic snarls occur every day. It is so expensive to acquire urban right of ways; relocate water, sewer, gas and electricity lines; build bridges for intersecting streets; and construct ramps for cars to use when entering and leaving the main highway that the cost of such construction runs as high as $3,500,000 a mile.

Most Traffic Goes Through Cities

But urban highways are every bit as vital as new construction in open country—if anything, more so, because nearly all the automobile traffic in the United States goes only 20 miles, the average distance from home to work, and in most cases work is located in or on the outskirts of a city. The only answer, despite the cost, is expressways.

Detroit's expressway system, which will eventually lace that huge, highly industrial city with 105 miles of broad, sunken arterial highways, already has dramatically proved its value, though only a short section of it has been completed.

The first section—a segment 2½ miles long—was opened on July 9, 1951. It consists of a divided six-lane highway running 18 feet below the level of adjacent streets, with a right of way about 300 feet wide. Traffic is one-way over the three lanes on each side. Trucks, buses and passenger cars travel at an average speed of 45 to 50 miles an hour.

Already the expressway is easily carrying

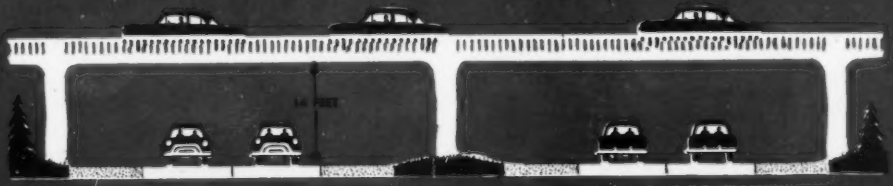
. . . Here's How Roads Should Be

Perfect roads, according to American Association of State Highway Officials, would fit the descriptions below. In addition, no curve would exceed 11 percent, no grade would be steeper than five percent, no bridge would be narrower than the full width of the highway and there wouldn't be any railroad grade crossings.

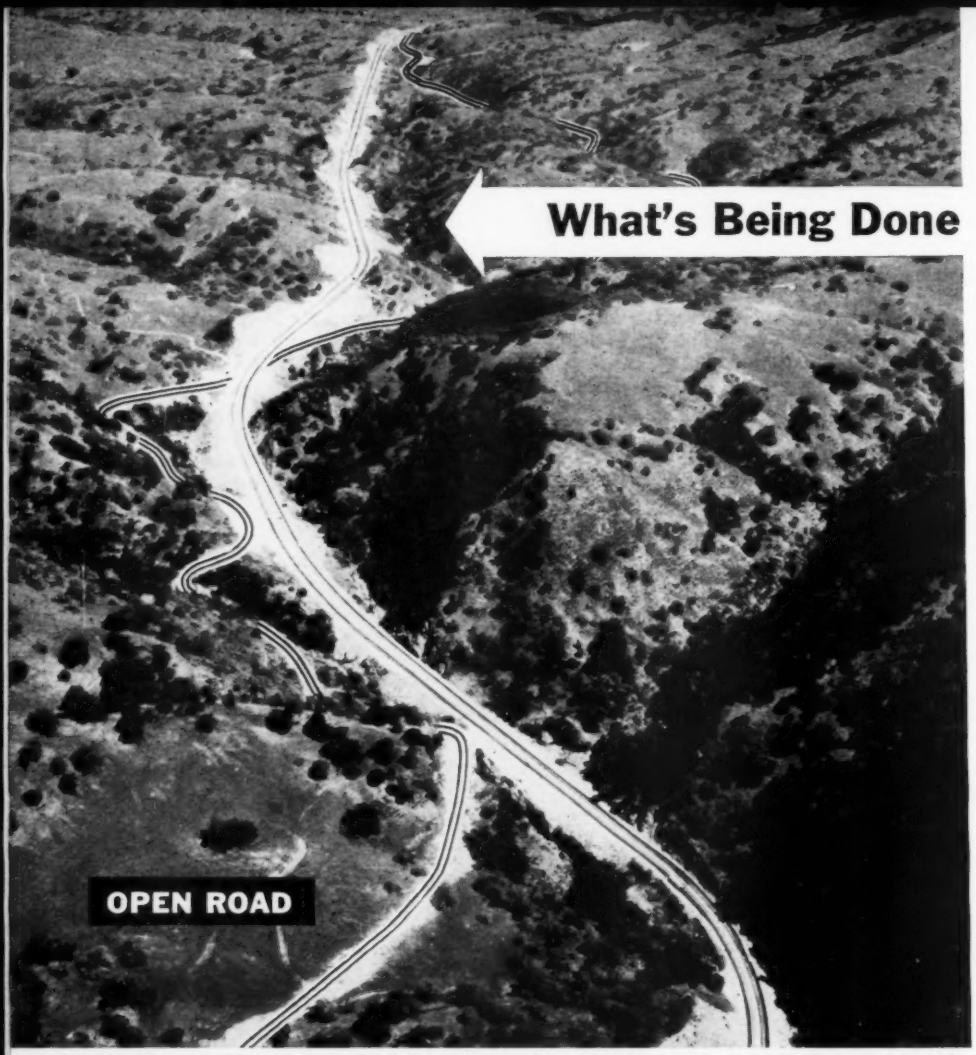
LANES 11 FEET WIDE are considered to be a minimum requirement for roads on which, in peak traffic, fewer than 200 cars travel each lane per hour.

LANES 12 FEET WIDE are demanded for any road on which the peak traffic is heavier than 200 cars an hour per lane. Shoulders should be 10 feet wide.

DIVIDED HIGHWAYS with a center strip from 15 to 40 feet wide and one-way traffic on each side are required whenever the average traffic on a route is more than 800 cars an hour.



CROSS TRAFFIC should always be carried above or below a divided four-lane highway when the average traffic exceeds 3,000 cars an hour. Overhead clearance should be at least 14 feet.



Four-lane divided highway in California supplants winding route stagecoaches used to ride.

five times as many cars per lane as the average main thoroughfare of older vintage. A heavy December snowstorm that clogged narrower nearby streets where parking was permitted scarcely slowed down the expressway traffic.

Expressways alone are not enough to ease the city traffic problem completely, however. Connecting streets in many instances must be widened, other streets made one-way and, especially, vast new parking space created. A frequently repeated suggestion for solving the last problem is to build skyscraper parking garages, with relatively small taxable frontage.

No one denies the country's desperate need for relief from its traffic situation. But how are we to raise the $60,000,000,000 required, at a minimum, to improve our highways over the next 15 years?

At least 33 states have chosen or are considering the alternative of toll roads. About 700 miles of superhighway on which tolls are collected have been built since 1940.

Truckers Pay Willingly

Since these roads are not free, the Federal Government disapproves of them and does not think that they properly belong in the interstate highway system, but they help

Expressway, deep in the heart of Dallas, is typical of those now being constructed in 31 cities.

to brighten the outlook considerably for the motorist who is willing to pay around a cent a mile to travel on them. Long-distance truckers save so much time and wear and tear by routing their wheeled behemoths over toll roads that they unhesitatingly pay up to 3½ cents a mile for the privilege.

New Jersey in late May reported that income from its new 130-mile Turnpike (PS, July '51, p. 69) was flowing in at a rate high enough to pay off the $255,000,000 cost of the road in 15 years instead of 25.

Heartened by such demonstrations as this and always deeply reluctant to increase taxes, state legislators have encouraged the drawing up of plans for more than 1,000 additional miles of toll road.

The Bureau of Public Roads, on the other hand, doesn't advocate toll roads, for these reasons:

- They can't possibly be substituted for free roads through cities, because of the short distances involved.
- In many cases, before the roads can be paid for, they'll start wearing out. As a consequence, they may never be paid for.
- Toll roads are primarily for long-distance travel. The distance between toll gates necessarily is too great for the roads to serve

[*Continued on page 236*]

STUBBY WINGS of peewee biplane look as if they were sheared off after a flight between two trees. They're set with a gap of only 39 inches between them, and staggered for balance and visibility.

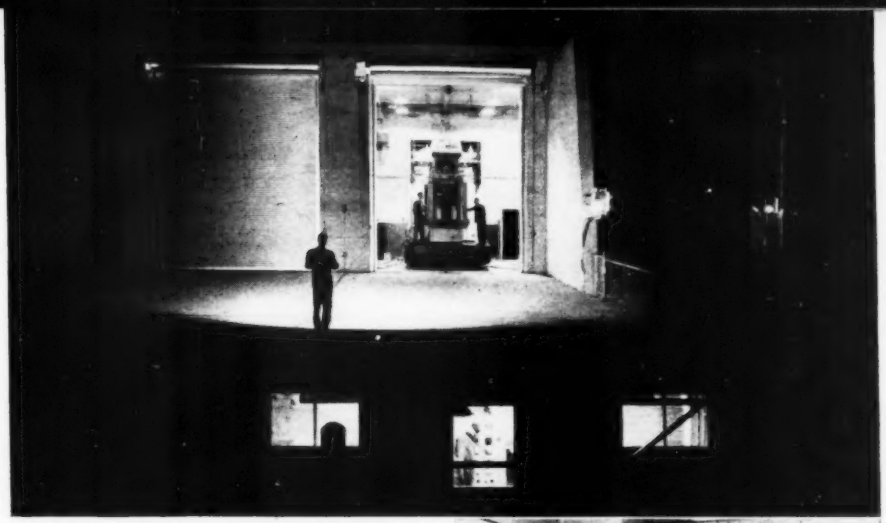
TINY COCKPIT seats pilot almost on fuselage floor, legs straddling oil tank. His feet reach within three inches of ship's nose to operate rudder pedals. Plane took a year to build, cost $2,200.

Plane Fits One-Car Garage

The Sky Baby—world's smallest airplane—is not quite 10 feet long, has a wing span of only seven feet three inches and weighs in at 452 pounds. Seated in the cramped cockpit with the 85-horsepower, four-cylinder Continental engine practically in his lap, test pilot Bob Starr has climbed to 800 feet—then buzzed the ground at 150 miles an hour. He carried no 'chute because there wasn't enough room. Baby was built for air-show exhibition by Starr and Ray Stits, both flight line inspectors, of Riverside, Calif. Stits designed the plane.

Come-Apart Boat Is Overnight Shelter

ALTHOUGH it looks like any other inflatable raft, the nine-foot rubber "houseboat" below leads a double life. It's a boat on the water, a shelter on land.



Short Circuits Made to Order

SHORT circuits of more than five million kilovolt-amperes—enough to blow the fuses in three-quarter-million homes—are created in the test cell above. Object is to see how large circuit breakers can "stop" such huge short circuits. Tests are watched by an observer in the shockproof dugout below the cell. A film record of the measurement made by an oscillograph is sent by pneumatic tube to a darkroom (right), and is ready for study in about two minutes. The cell is one of five at General Electric's new Switchgear Laboratory in Philadelphia.

On arrival at a campsite, a yank on two zippers separates the boat into two pieces. The paddler upends the halves (center photo) and draws across the attached canopy to form overnight sleeping quarters roomy enough for two (below).

Albert Meyer, Berlin boatbuilder, designed the combination boat and tent.

Flying Bazooka

Outsmarts Bombers

New jet's radar and thinking instruments find an enemy miles away, latch onto and track him, close for combat, aim and fire rockets.

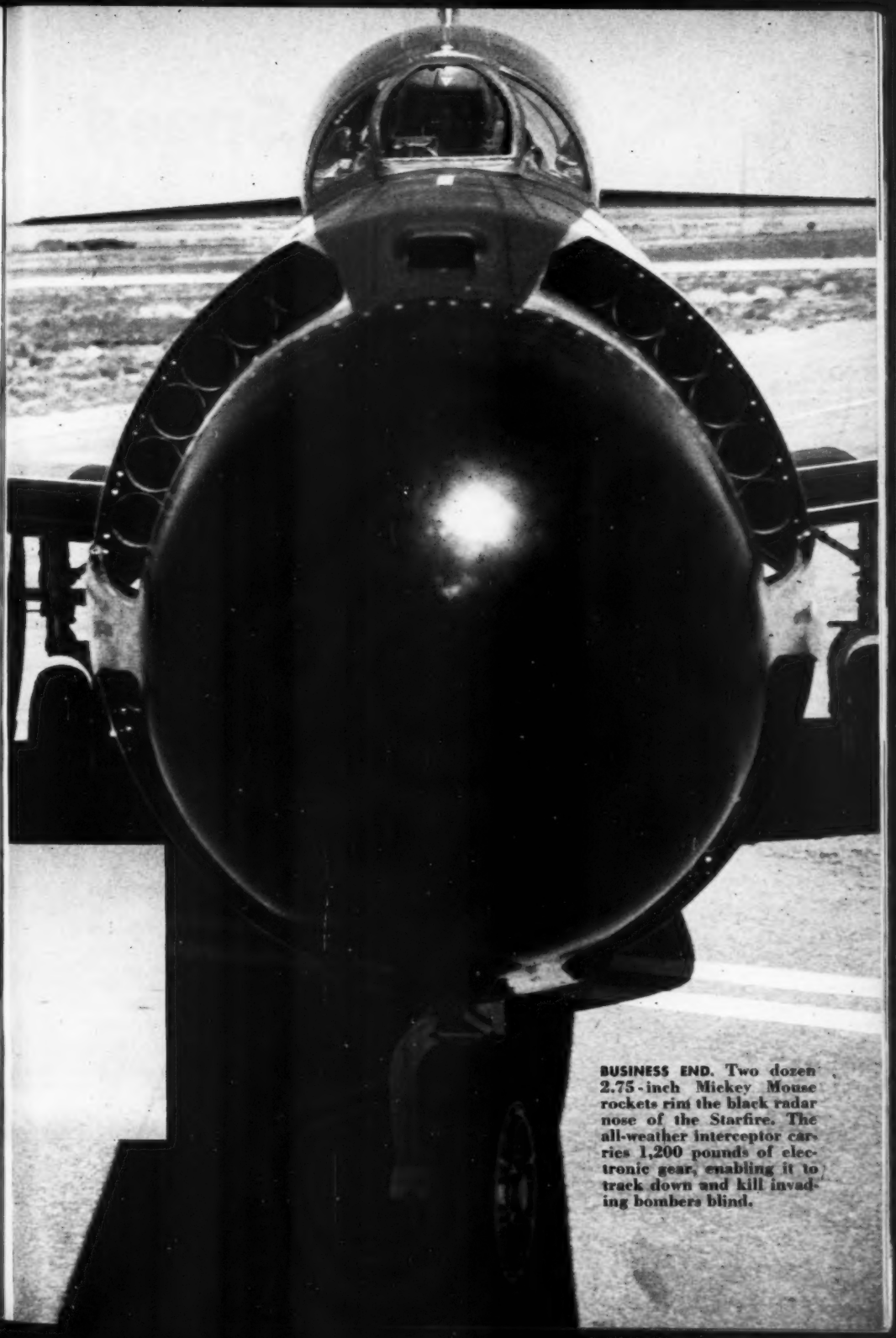
TWENTY-FOUR rocket guns ring the radar-packed snout of the Lockheed F-94C, the Air Force's newest jet weapon. Unveiled last month, the Starfire is now rolling off the production line. The plane is the first U. S. interceptor to abandon machine guns and cannon.

The Starfire also can carry underwing rockets or napalm bombs, but its main job will be to launch a forward barrage to down atom-bomb-carrying enemy bombers. It has the speed—more than 600 miles an hour. It can fly higher than nine miles. And it is almost wholly automatic: there are electronic devices that steer it during the target run, and it has push buttons for aiming and firing the rockets.

Main duties of the pilot and radarman, who sit tandem, are to take the plane off, fly it to the combat area and then bring into action and monitor the electronics.

Wings of the 10-ton Starfire are straight instead of swept back, to make it a more stable rocket-firing platform at high speeds. For short-field landings, a parachute pops out of the tail as a brake. Special rockets help it take off with a heavy war load. And it is one of the few fighters to have ILS (Instrument Landing System) for low-visibility landings.—*Andrew R. Boone.*

THE STARFIRE SHOOTS its rocket barrage in flight. The most powerful single-engine jet in production, the F-94C has a Pratt and Whitney J-48 developing 6,250 pounds of thrust. An afterburner gives extra power boost. The new continental defender is 41 feet five inches long, has a wing span of 37 feet six inches, stands 13 feet seven inches high.



BUSINESS END. Two dozen 2.75-inch Mickey Mouse rockets rim the black radar nose of the Starfire. The all-weather interceptor carries 1,200 pounds of electronic gear, enabling it to track down and kill invading bombers blind.

For Speed

SIATA "Grand Sport"

LESS THAN THREE FEET HIGH without windshield, Farina-styled "Grand Sport" is powered by four-cylinder, 65-hp. Fiat engine with twin carbs, will do 115 m.p.h., costs $4,250 in U.S.

JAUNTY 950-POUND RUNABOUT below takes special Crosley or small Fiat engine, tops 100 with either. Typical bucket seats offer firm support at high speeds. Price tag: $3,650.

SIATA "Spider"

By Kendall W. Goodwyn

A FEW weeks ago in Turin—the "Detroit of Italy"—two men who had traveled close to 5,000 miles for the occasion picked their way through the crowd at the 34th International Motor Show. On display in the vast exhibition hall were more than 400 glossy new cars from 59 auto manufacturers in England, France, Germany, Italy and the United States.

When they came to the Italian sports cars—the Fiats and Ferraris, Alfa Romeos, Lancias, Siatas, Cisitalias—the two men stopped for a long and thoughtful look. The visitors were Packard's Vice-President W. H. Graves and Chief Stylist Ed Macauley,

and Style
It's Italian Cars Now

INSPIRED BY JET PLANE, Pinin Farina created this striking Lancia "Aurelia." For $6,500 you can have one just like it. Windshield bulge makes room for close-up steering wheel.

While Detroit looks 'em over for new style trends, sportsmen are applauding their brilliant performance as road racers.

in Turin to confer with designers Scaglione and Bertone about the possibility of adding continental flair to future Packards.

Italian Styling May Start New Trend

Graves and Macauley were not the only U. S. auto executives interested in what the Italian stylists were up to. One American car already on the market—the '52 Nash Golden Airflyte—revealed the fine Italian hand of world-famed Pinin Farina. Another Turin designer, Ghia, had done the coachwork for Chrysler's experimental car, the K-310. And trade winds carried the rumor that Studebaker was keeping a weather eye peeled for what was beginning to assume the proportions of a trend.

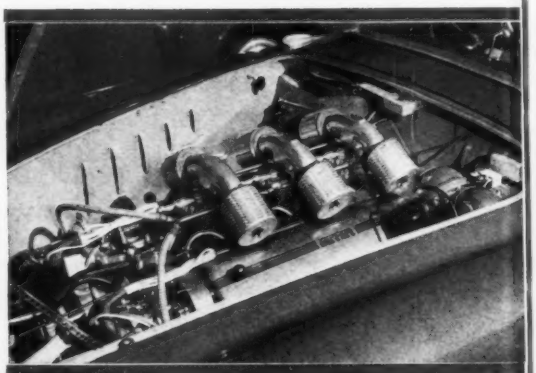
One all-out admirer of the Italian school of automotive design stacked it up like this: "The English are sticking doggedly to their traditional body styling, practically unchanged in 15 years. The smart French cars, like the Delahaye, are sweeping and graceful but show little originality. German stylists are over-emphasizing functionalism . . . Our American cars? They're burdened with non-essential bulges, chrome gingerbread and fancy figureheads. The Italians are pioneering a trend toward simplicity."

It seems unlikely that the roomy, easy-

COMING OUT OF SHARP TURN in 1952 Bridgehampton Cup Race, Bill Spear's winning Ferrari V-12 leads Allard driven by Fred Wacker, president of Sports Car Club of America.

—is this the

AS FUNCTIONAL AS A HIGH-POWERED RIFLE, this 160-m.p.h., $13,000 "Le Mans" model Ferrari (coachwork by Alfredo Vignale) uses the compact V-12 engine below. Power plant fea-



riding, quiet-running American passenger car—designed to please the millions of motorists who drive on level U. S. highways—will be drastically altered along the lines of these costly, hard-sprung, high-speed automobiles built to negotiate the narrow, twisting roads of Europe. All the same, the next car you buy may reflect, in many small ways, the influence of the Italian stylists' freshness and imagination.

Speed Addicts Rave About Italian Cars

With the fast-growing legion of sports-car fans in America, it's a different story. They are really hopped up about these low-slung speedsters coming out of Turin, Modena and Milan. Until recently, John Bull had the sports-car market in the U. S. rolled up tighter than a Briton's umbrella. If you wanted a "competition car"—and since you couldn't buy one stamped Made in U. S. A.—you probably went for a perky little MG, or if you had twice the shillings to spare, you slipped into the leather-lined cockpit of a Jaguar XK 120 two-seater.

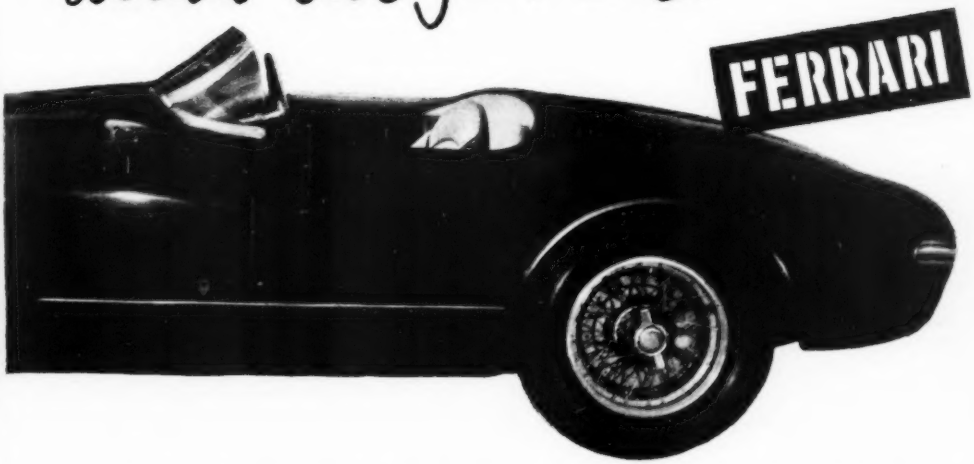
Now—despite the fact that the price tags on these bucket-seat raceabouts and four-foot-high, two-mile-a-minute "saloons" make you thankful for the Detroit assembly line—the *aficionados* are beginning to cast yearning glances at the Italian version of the car that puts the thrill back in driving.

Ferrari Beats America's Fastest

The reason for the sports-car fraternity's infatuation seems clear. It's performance they want. And, in the international field of road racing, the Italian entries have really been tearing up the pea patch.

First it was the Alfa Romeo that rocketed to fame in the European Grand Prix circuit, major league of road racing. Lately the fabulous Ferrari has been stealing the show. Besides a raft of lesser races in the last 12

world's best fast car?



tures three dual down-draft Weber carburetors, develops 250 horsepower at 6,500 r.p.m. Since car weighs only 1,847 pounds, car weight per horsepower is less than 7½ pounds (average American car carries about 28 pounds per horsepower), affording phenomenal acceleration. At wheel is Ferrari's U.S. representative, racing driver Luigi Chinetti.

months, Ferraris have won the Italian Grand Prix, the French Grand Prix and—perhaps the toughest one of all—the 1,936-mile Mexican Road Race that extends the full length of Mexico, much over mountain roads.

In this grueling test, a 160-horsepower, four-seater Ferrari, with an astonishing average speed of 88 m.p.h., showed its tailpipes to a field that included some of the fastest U. S. cars—Cadillac, Chrysler, Mercury, Packard, Hudson, Buick and Oldsmobile—as well as other European entries. Just to nail it down—in each of these same three major racing events, the *second* car to flash across the finish line also bore the prancing-horse symbol of Signor Enzo Ferrari's little auto factory near Modena, Italy.

And at Bridgehampton, Long Island, last May 24, a Ferrari V-12 copped the checkered flag at the end of the 100-mile Bridgehampton Cup Race, after a spine-chilling challenge by a Cadillac-powered Allard J2.

They Hug Ground Like a Cornered Cat

The consensus credits the Italian cars' performance to their remarkable ability to take corners at high speed. Alex Tarpinian, who races Siatas and Cisitalias, says "they come out of a turn like nothing else on wheels."

Alexis von Freymann, chief engineer for Fergus Motors, big New York importers of foreign cars, puts it this way: "The one

[*Continued on page 248*]

styling is bold, functional

CISITALIA Picture above shows graphically how low Italian cars are built. The man is five feet eight; the "Cissy" just over four feet.

ALFA ROMEO New 1900C sports coupe styled by Touring has four-cylinder, 100-horsepower engine.

ABARTH Strictly a custom job, this Scaglione-designed model made a big hit at Turin. Its four-cylinder engine develops 80 horsepower.

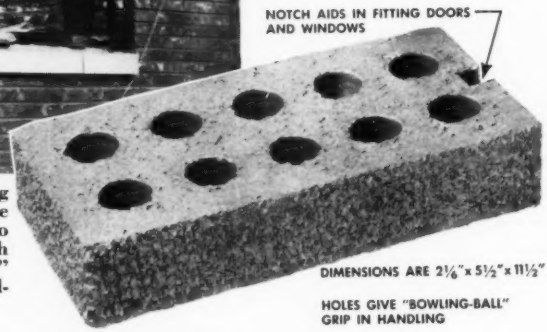
ZAGATO Little sedan below features unusual visibility. Two sets of gears provide 8 forward speeds. Supercharged engine pushes it to 100.

UNVEILED AT GENEVA AUTO SHOW this spring, Fiat's trim two-seater saloon offers a 110-hp. V-8 engine, with 8.5-to-1 compression, 124-m.p.h. speed, all four wheels independently sprung. Car costs about $6,000 in U.S. Italy's biggest, oldest (1899) auto maker, Fiat employs 65,000, operates own iron mines and steel plants, makes Italy's first jet plane.

MASERATI Shown here at the recent exhibit in Turin is the 100-hp., six-cylinder Model A6G Maserati. Wire wheels with knock-off hubs are characteristic of competition cars. Air scoop on hood helps cool carburetors. Long famed for racing prowess, Maserati-built engines have powered winners here and abroad.

Big Brick Laid Fast

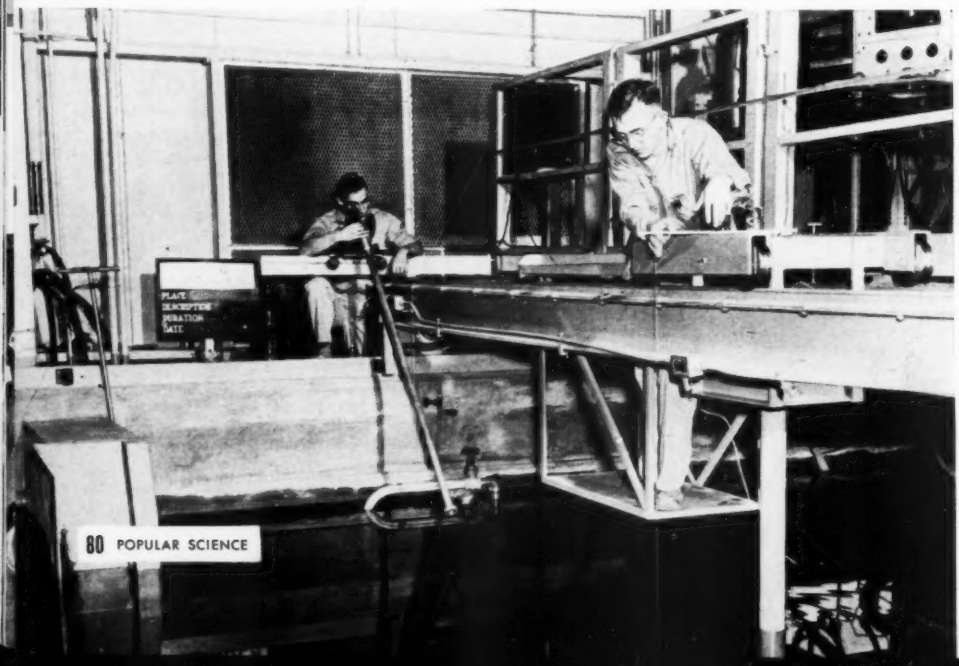
SOLID brick homes as inexpensive as good frame houses are promised by the oversize "SCR brick." It is said to enable a mason to build 60 to 100 percent more wall area per day. A single thickness forms a complete exterior wall. Structural Clay Products Institute developed the new brick.



NEW BRICK (right) speeds building and cuts labor cost. Ten holes give handy grip and keep weight down to eight pounds. A ¾-inch by ¾-inch notch at one end receives metal "fin" of steel window (above), or blind-stop extension of wood window.

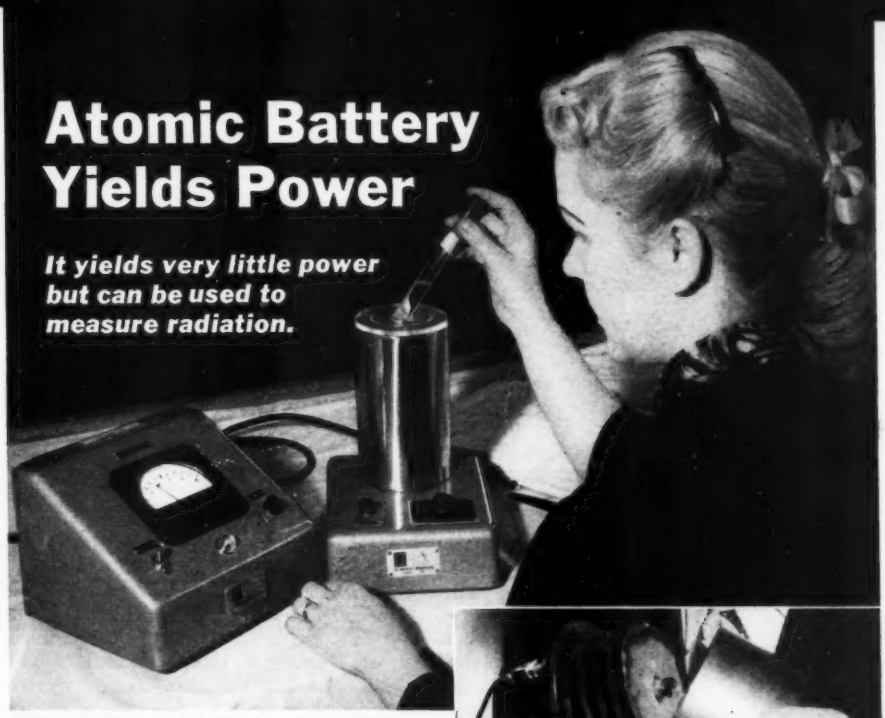
Atomic Pile Dunked in Pool to Test Shield Materials

SUBMERGED in water to protect experimenters from its rays, a mobile reactor at Oak Ridge, Tenn., tests samples of shielding materials in a "swimming pool" 40 feet long and 20 feet wide and deep. Two metal bridges span the pool, rolling on wheels along tracks at the sides. The submerged pile hangs from one bridge; the other carries instruments. In the view below, an observer with a long telescope (at far side of pool) directs another who is adjusting the position of an instrument.

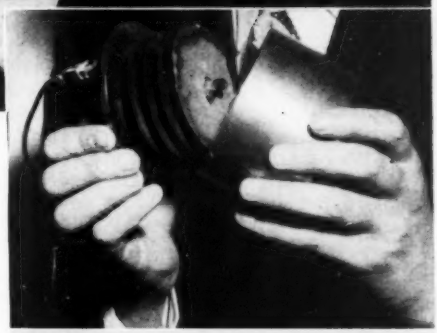


Atomic Battery Yields Power

It yields very little power but can be used to measure radiation.



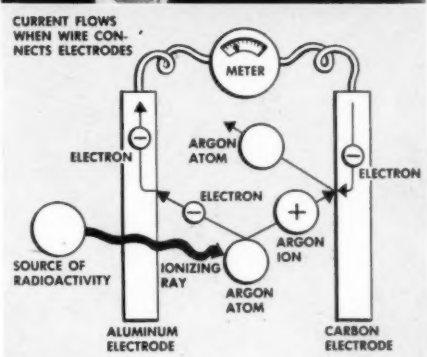
INSTRUMENT powered by an atomic battery (above) measures rays from tubeful of radioactive iodine solution. Battery at right, one of many designs, has multiple disk electrodes.



ENGINEERS have dreamed of turning atomic energy into electricity more directly than by using a pile's heat to make steam and run a turbogenerator. Now an "atomic battery," invented by Philip E. Ohmart of Cincinnati, turns the trick on a midget scale. Bring radioactive material near it, and it furnishes electric energy. While it would have to be of one-cubic-yard size to light a single 100-watt lamp bulb, it has found practical use in radiation meters.

Like ordinary chemical batteries, it has electrodes of two unlike materials. But instead of a liquid electrolyte between them, there is a gas, such as air or argon. Since argon is chemically inert, its suitability emphasizes that current is not produced by chemical action. What does happen is this:

Atomic energy turns atoms of gas into ions, or charged particles. When the ionized gas reverts to its normal uncharged state, with the help of electrons from an electrode, energy is returned and current flows. One electrode must yield electrons more readily than the other; carbon and aluminum are among many suitable choices.



SIMPLE ATOMIC BATTERY uses rays' energy to ionize argon gas—and yields electric energy, in return, when ions recombine. Electrons from carbon (which yields them more readily than aluminum does) neutralize argon ions. Argon's leftover electrons reach aluminum, and flow through wire to replace electrons lost by carbon, producing an electric current.

The Line Forms Here for

By L. G. Tooker

EVEN the most enthusiastic prophets of space travel admit that there are still some problems to be solved before the first rocket takes off for the Moon. But there's one thing that won't be any problem: getting passengers. Right now the Hayden Planetarium, in New York City, has a file of more than 24,000 people who have signed up for seats on the inaugural interplanetary tour.

Although the Planetarium is still taking reservations, it makes no promises. It is not building a rocket ship for space flight. Planetarium chairman Robert R. Coles says that the oldest applicant, an 85-year-old West Virginia woman, who wrote, "Hurry up with that space ship as I'm getting on in years," probably will not make it. But he thinks the chances are good that a 6½-year-old applicant will live to make the flight.

The applications are now being tabulated and will be placed in an airtight vault with the hope that some day they may be turned over as "active" reservations to the first organization that sets up commercial interplanetary tours.

Easier Than Guided Missiles

And that day may not be too far distant, according to General Joseph T. McNarney, U. S. Air Force, retired, now president of Consolidated Vultee Aircraft Corp. "Actually," he said recently, "some of the problems we are working on right now in the field of guided missiles . . . are basically more difficult than the problem of building a space ship. If we can accomplish the former, and I assure you we will, then there is absolutely no reason why we can't also do the latter."

And to be even more realistic about the

More than 24,000 people already have signed up for space flight. Here's why some want to go.

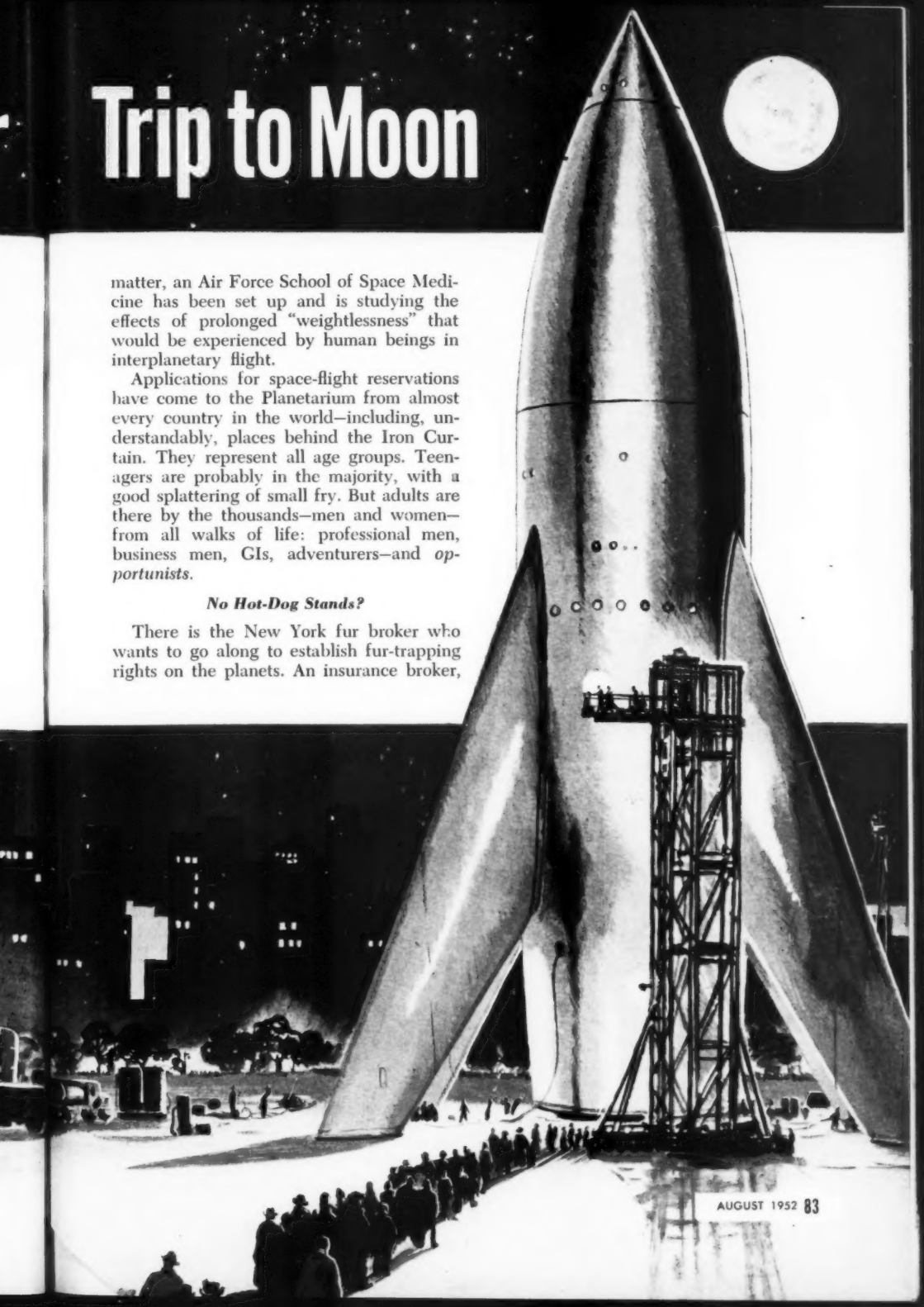
Trip to Moon

matter, an Air Force School of Space Medicine has been set up and is studying the effects of prolonged "weightlessness" that would be experienced by human beings in interplanetary flight.

Applications for space-flight reservations have come to the Planetarium from almost every country in the world—including, understandably, places behind the Iron Curtain. They represent all age groups. Teenagers are probably in the majority, with a good splattering of small fry. But adults are there by the thousands—men and women—from all walks of life: professional men, business men, GIs, adventurers—and *opportunists*.

No Hot-Dog Stands?

There is the New York fur broker who wants to go along to establish fur-trapping rights on the planets. An insurance broker,



OFFICIAL HAYDEN PLANETARIUM APPLICATION

Interplanetary Tour Reservation

★ ★ ★

Your name and address will be kept on file in the Hayden Planetarium archives.

Please list the information below and mail this form to Interplanetary Tour Reservations, POPULAR SCIENCE MONTHLY, 353 Fourth Avenue, New York 10, N. Y.

NAME..... **AGE**.....
LAST FIRST

ADDRESS..... **CITY**..... **STATE**.....

Check tour desired: ☐ **Moon** ☐ **Venus** ☐ **Mars** ☐ **Jupiter** ☐ **Saturn**

SIGN UP FOR THE FIRST MOON FLIGHT—or take your pick of the planets. Clip and fill in the blank above, then mail it to POPULAR SCIENCE MONTHLY. Your name and address will be turned over to the Hayden Planetarium to be held until first space trip is announced.

destination Moon, already has named the firm he would like to establish, the Interplanetary Travelers Insurance Co., with address Moonbeam Drive. He plans to pay claims in interplanetary currency.

A salesman of building materials wants to go to the planet within easiest commuting distance of the other planets. "There'll be a lot of new homes going up and I'll have to get around."

Romance prompted the application of a sergeant who wants to spend his honeymoon on the Moon. He asked that his name and that of his girl friend be kept secret as he had not yet popped the question.

One potential space pioneer explained his urge simply, "I have served in the Air Force and just love space."

And another, "You may think I am a little crazy, but send me two tickets to the Moon."

The older, more conservative applicants are satisfied with going to the Moon. The brasher younger element go for the planets—with Mars top choice. One eager beaver wrote in canceling a previous application for Mars and changing his destination to the Moon. "Lunar flights might materialize sooner because it is closer," was the reason.

Neighbor Moon (240,000 miles away) has been eyed by space-flight enthusiasts for many years. Because it is so close, we know more about the Moon than the more distant planets. Even with the naked eye we can make out solid physical features on the Lunar surface. With a little imagination and a low-power telescope these become rugged but romantic mountains and valleys.

You Must Travel Light

Because the Moon is closest to space-flight reality, the Hayden Planetarium has prepared an advance briefing for passengers on the first Lunar rocket voyage:

Only one pound of luggage will be allowed per passenger, since the rocket ship will burn 66 pounds of fuel for every pound of its structural weight. For take-off, passengers will be strapped to special supports to minimize the shock of acceleration. Passengers with high blood pressure may experience a momentary blackout.

Upon arrival at the Moon, say the Planetarium's experts, passengers will be instructed to don oxygen helmets and anti-ultraviolet-ray suits. They will have to learn to walk all over again since each person will weigh only one-sixth as much as he does on

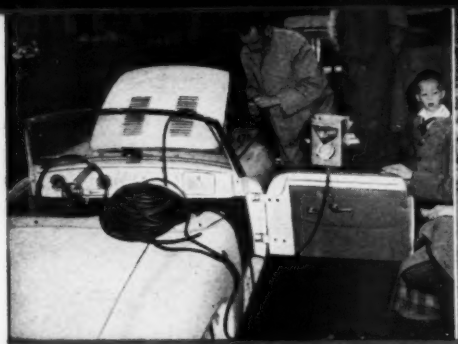
[*Continued on page 226*]

LOWELL THOMAS, CBS news commentator and internationally famous explorer and author, signs up for interplanetary flight with Robert R. Coles, Hayden Planetarium chairman.

SPACE SCALE at Planetarium shows 95-pound applicant that he will weigh only 14½ pounds on the Moon. Other scales give weight on the planets.

Interplanetary Weight Chart

IF YOUR EARTH WEIGHT IS—	You Would Weigh on— (to the nearest pound)				
	MOON	VENUS	MARS	JUPITER	SATURN
70 lb.	11	60	27	185	82
80 lb.	13	68	30	211	94
90 lb.	14	77	34	238	105
100 lb.	16	85	38	264	117
110 lb.	18	94	42	290	129
120 lb.	19	102	46	317	140
130 lb.	21	111	49	343	152
140 lb.	22	119	53	370	164
150 lb.	23	128	57	396	176
160 lb.	25	136	61	422	187
170 lb.	27	145	65	449	199
180 lb.	28	153	68	475	211
190 lb.	30	162	72	502	222
200 lb.	32	170	76	528	234
ENTER YOUR ➤ WEIGHT					



A FRENCH ENTRY, the Deutsch-Bonnet. Hose feeds gas ration from can to carburetor.

TWO LITTLE REAR-ENGINE JOBS—Volkswagen and Renault—round turn at 34th and Park.

Pint-Size Cars Get 40 Miles per Gallon in Big-City Traffic

NEW YORK'S Park Avenue was invaded one recent Sunday morning by a bevy of bantam cars. They were matching miles per gallon in the first running of the "Scotchman's Derby"—an economy test for small automobiles. The field included French, German and English entries. Each car, having received a ration of one meticu-

TYPICAL STUDIO, in foreground, will have banked seats arranged in a V for better camera placement. Beyond are rehearsal halls, at second-floor level, and rooms for set assembly.

Model Previews

TELEVISION shows will be put together with the slick, production-line efficiency with which automobiles are assembled when CBS opens Television City, the world's largest telecasting "factory," in Hollywood next October. Four studios 42 feet high, each with as much floor space as 10 six-room bungalows, together with master control rooms, work-

FIRST UNIT of Television City will look like this. Four giant studios at right form core of future plant. Building at left contains offices, cooling equipment, transmitters.

GOOD TO THE LAST DROP. The Morris Minor finally went dry—after covering more than 40 miles on a gallon. Race driver G. Benett used a light foot this once, to save fuel.

lously measured gallon of gas, set out to see how many times it could cover the 2.7-mile course on Park Avenue between 34th and 60th Streets, observing all traffic rules.

Supervised by the Sports Car Club of America, and jointly sponsored by Esso, Mile-O-Meter and *Auto Sport Review*, the Scotchman's Derby turned out to be a great day for the English. In the larger class (over 1,000 cc.), a Hillman Minx made the most of its portion of petrol to win the plaque with a run of 34.62 miles. In the smaller division, the laurels went to a Morris Minor, whose miserly power plant propelled the little car to the day's distance record: 41.63 miles.

America's First Television "City"

shops, offices and rehearsal halls, form the initial, three-story unit of the plant, which will occupy 15 acres. Eventually, Television City will contain 20 studios and a 13-story administration building and will cover 35 acres.

Traffic within the huge plant has been as carefully planned to avoid jams as that on a superhighway. Actors will move from parking lot to dressing rooms to rehearsal halls to studios without ever intersecting the passage of sets from raw-material delivery rooms to carpentry and paint shops to stages.

An elaborate, two-ton model of Television City, pictures of which are shown here, is now touring the country.

Half-million dollar electronic control system will make possible 62,500 lighting effects.

Lombardo's *Tempo VI*, hitting more than 100 on a straightaway, rides as much on air as

It Takes All Year

Guy Lombardo, orchestra leader and Gold Cup racer, tells how

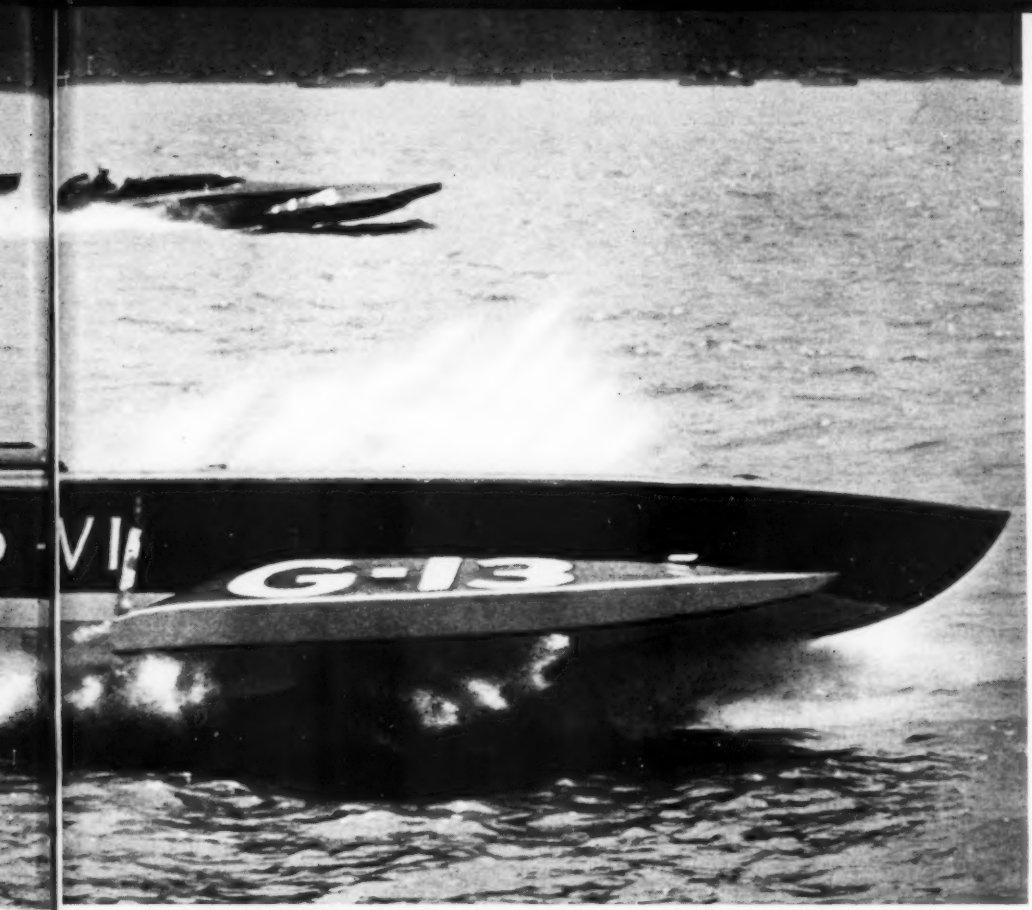
By C. B. Palmer

"ANY man who asks how much it costs to maintain a yacht," J. P. Morgan is said to have exclaimed, "shouldn't think of owning one."

That applies, too, to the owners of the roaring power boats that will compete this month on Lake Washington, near Seattle, for the famous Gold Cup, an annual award of the American Power Boat Association.

One of the best known of the country's 20 or so Gold Cuppers is Guy Lombardo, who is even better known to most people as leader of a dance orchestra.

His 1,220-horsepower *Tempo VI* would set you back a cool $50,000 to $75,000, not to mention the $7,500 to $10,000 a year you'd average on alterations, maintenance and handling.



on water. Its 1,220-hp. Allison engine drives a tiny propeller geared up to 9,000 r.p.m.

to Win a Big Race

he tinkers and trains to drive a boat that can outrun your car.

Lombardo has twice won the American championship for taking the most races in a season. He won the Gold Cup itself in 1946 and in doing so set two records—for the fastest single heat and for the fastest race. In 1948, in time trials, he did a record mile at 118.2 M.P.H. The boat, built in 1939 and owned by Lombardo since 1945, has won more races than any other craft in its class and set more than 50 records.

Lombardo, who works nights, spends much of his days all year round making plans or tinkering with his boat near his home at Freeport, Long Island, for a few hours' actual racing. There are only half a dozen big-league races, run late each summer in widely scattered parts of the country. After each season ends he sees room for improvement. One season he added six feet to the length of *Tempo VI;*

then he cut off three feet of the added six.

This year he moved the entire engine and gearbox aft one foot. To understand why, you first need to understand some of the principles of this kind of hull. The bottom itself is slightly pointed up forward, becoming quite flat aft. But built out from the sides and projecting below the hull are the sponsons, something like pontoons. When the boat is at racing speeds it rides only on the after ends of these sponsons and the aftermost part of the hull, reducing surface friction. The sponsons also trap air as the boat rushes forward and, to escape, the air must lift the hull enough to get out around the after ends of the sponsons. The more "air lift" a driver can get—up to the point where the boat would become dangerously unstable—the faster he can go.

One Foot Is Enough

Lombardo's idea, worked out last winter, was that he was losing some air lift because the turbulence from his propeller was forcing the stern of his boat up. That meant the bow would go down, and less air would get under the hull. With his engine and gearbox moved back a foot, he figured, their weight would keep the stern down.

Speedboaters all try to do something about their speed on the turns, because that is where those impressive speeds on the straightaways, running up to 150 m.p.h., are cut to half or less. A boat thrown into a turn at anything like top speed would either skid right out of sight or, more likely, flip over. So the racers experiment with everything in the boat but the chromium finish. They modify the size, shape and placement of the sponsons, reshape the stabilizers (small vertical fins underwater), fool with rudders of many different sizes and shapes.

LOMBARDO AND MECHANIC Werner Maeder (left) go over plans for redesigning *Tempo VI*. Lombardo has partly rebuilt boat in effort to boost speed every year since he bought it.

Yet happenstance can sometimes outdo both the slide-rule boys and the hunch players. A season or two ago one of the big boats was being readied for a warm-up. It was a twin-rudder job, but one of the rudders was away at the factory for replacement. The crew decided to put the boat in the water anyway, to turn over the engine. They got underway, opened it up a little, tried a bit more speed and ended up wide open. The boat responded beautifully to avoid a disabled boat in front of him. He was lucky and escaped with a broken arm.

***TEMPO VI* SINKS** in Detroit River in 1948 during Gold Cup race after Lombardo swerved

SPONSONS on which forward part of boat rides at high speed are seen alongside hull in this view of *Tempo VI* being lowered into water. Hull is planked mahogany on maple stringers and frames; deck, aircraft plywood. Some boat owners prefer all-plywood hulls. Lombardo believes planking "gives" more and seems to let boat recover better from shocks.

to one off-center rudder. They never did bother with the other one.

The least apparent element of preparation for the Gold Cup is the driver's physical conditioning. To finish in the money, a Gold Cupper has to average close to 90 m.p.h. throughout 30 laps in the 90-mile course. Against the efforts of the waves and the boat to pitch him out, a driver can use only his own strength.

"Some people tried using safety belts to hold them in, but that's bad business," Lombardo says. "Everything happens too fast. If your boat flips over, you don't know it's flipping. You just come to in the water. And it's better to be in the water unconscious, free, and in a life jacket than it is to be unconscious, upside down and strapped in a boat headed for the bottom.

You Hold Yourself In

"So a man holds himself in by a funny method. He has one foot free for the accelerator, of course. The left foot he puts on a block placed just so on the cockpit floor. He pushes hard down against that and hard back against the back of the cockpit. At the same time his hands are at the bottom of the steering wheel—not the sides—and he is pulling *up* on the wheel, pushing himself *down* in the seat."

Lombardo dwells on one more almost intangible factor in driving a howling, pitching, spray-dusted boat in choppy water at 100 m.p.h.—the "seat of the pants" feeling:

"A man can't know his boat and judge his boat and handle his boat unless he can feel it where he's sitting. That means not being distracted by a lump in the cushion or a wrinkle in his pants; it means not too much and not too little padding. The seat of your pants tells you things your instruments can't —stability of the boat, condition of the water, how she's doing on a curve, what a gusty crosswind is doing to you."

Not that he doesn't rely on instruments. He has plenty: oil pressures for engine and for gearbox; water temperatures for gearbox and for both sides of the engine; manifold pressure; fuel pressure; tachometer; clock and stop watch.

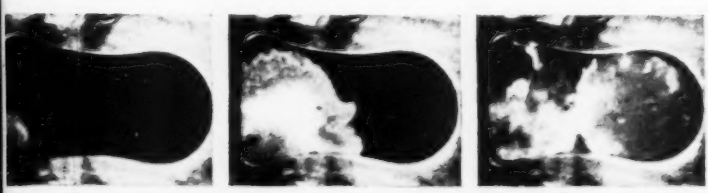
Each dial has been rotated so that when everything is working at its best all needles point straight up. Then, when he is pounding around the course, concentrating on his position, he doesn't have to read dials—his eye has only to spot any needle that doesn't point to "12 o'clock." END

German Entry in Le Mans Road Race Slowed by "Dive Brake"

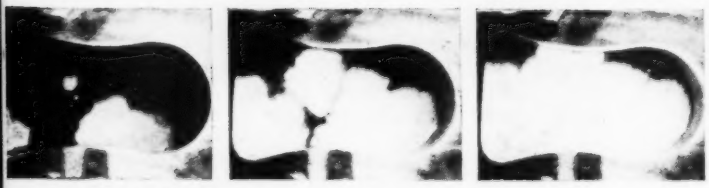
THIS Mercedes Benz experimental 300 is so fast that it needs a "dive brake" like an airplane's. It appeared at the famous road race at Le Mans, France, this summer. The "aerodynamic air vent" looks like a baby wing. When the driver opens it, the increased drag slows him from 156 to 100 m.p.h. before he touches the wheel brakes. The German three-liter job is plenty hot. A sister car won at Le Mans, covering the 2,333.5 miles—about as far as from New Orleans to San Francisco—in 24 hours.

Camera Catches "Wild" Knock in Auto-Engine Cylinder

FOR the first time engineers have captured on film a "wild ping"—an unusual, extra-heavy variety of auto-engine knock that motorists occasionally hear. Much louder than a common knock, it sounds like "spikes going through an engine." The high-speed photos, taken by General Motors engineers through a transparent quartz window, reveal how preignition causes it and compare it with normal knockless combustion. An entire sequence showing the knock was taken in less than 4/1,000 of a second.



NORMAL KNOCKLESS combustion in engine cylinder is seen in upper row of views. In first frame, spark plug (lower left) ignites mixture. Combustion then spreads gradually, as shown in the succeeding views.



"WILD PING" starts (first frame) with ignition in three places at once; at spark plug, flying incandescent carbon particle (center of frame) and carbon deposit. Uneven burning (following views) causes the knock.

"Pebble pup" Tom McDowell and older friend crack limestone to get at its calcite crystals.

They Hunt Rocks...

and Hope for Uranium

But the greatest rewards of their fast-growing hobby, rockhounds admit, are fun, fresh air and friends.

By B. F. Sylvester

SHARPE OSMUNDSON, a baggageman on a Union Pacific train, has arranged his schedule to give him a layover every third day at Green River, Wyo., because there are lots of rocks around Green River. With his friend Louis Hines, a retired wild-horse wrangler, Osmundson combs the Wyoming hills for rare specimens to tote home to his basement in Council Bluffs, Iowa.

On his vacations, Osmundson likes to highball down to Mexico and search abandoned silver mines. He now has 1,000 labeled samples of minerals, 1,000 cut and polished stones, and 500 carefully catalogued fossils. This summer he hopes to find something as interesting as an exhibit he once saw in Colorado—a petrified fish 17 feet long whose stomach contained another fish seven feet long with another fish inside.

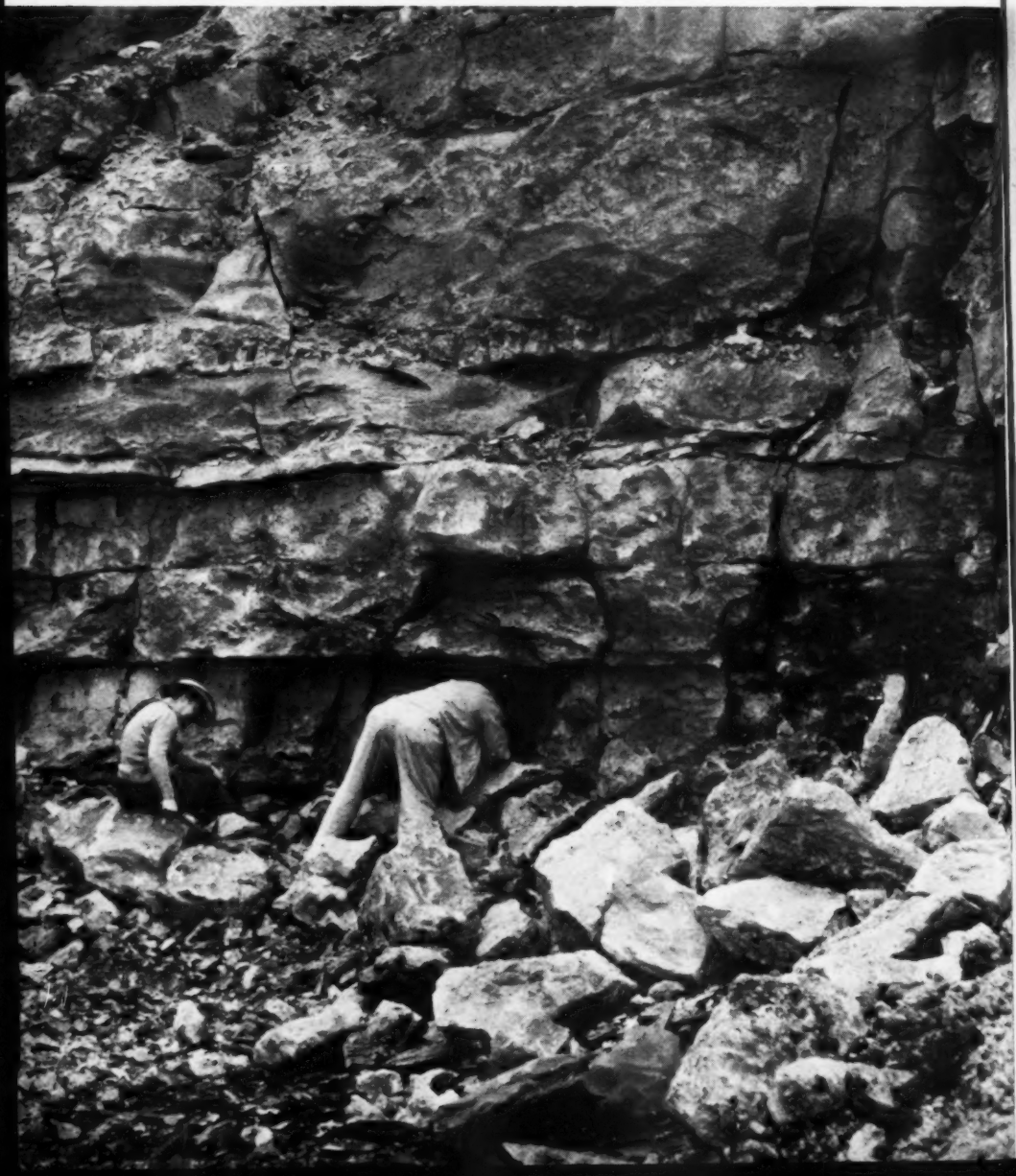
Osmundson is a rockhound. You will not

find the word in Webster's Dictionary, but it means a person who collects rocks and minerals, mostly for fun. There are now upwards of 250,000 rockhounds in the United States.

Many of them carry Geiger counters in the hope of collecting from $10,000 to $35,000 from the Atomic Energy Commission for finding uranium. But, says Osmundson, the friends you make are more valuable than anything you are likely to find. Rockhounds share the deep satisfaction that comes from contact with things that were created millions and millions of years ago.

Rocks with collecting value are found in all 48 states, but the principal hunting grounds are the Rocky Mountains and the

HUNTING FOR FOOL'S GOLD (iron pyrites) at base of a Missouri River bluff in Nebraska. Rockhound at right below just missed being killed by falling rocks, minutes earlier.



West Coast, which were specially favored when the forces of nature began forming rocks. Vacationers with car trunks filled now are redistributing this wealth to living rooms, back yards and basements all over America.

Rocks Come Before Wife

Osmundson says that most of the rockhounds whom he knows began as fishermen, but the fever also can be caught in other ways. For example:

Wayland W. Magee, a retired farmer and former member of the Federal Reserve Board, came across a rock that reminded him of his geology studies in college. That did it. Mrs. Magee reported to friends last summer that she was a new kind of widow. Without her realizing it, her husband had become a rockhound, and now had left their home in Bennington, Neb., for six weeks to look for rocks and uranium.

He had offered to take Mrs. Magee along in the one-ton Chevvy truck that he had bought and equipped for the expedition, but when the time came they had decided that there was not enough room for her, since he expected to bring about 500 pounds of rocks back from his expedition.

At Worland, Wyo., Magee went to the newspaper office and asked the editor, "Who is your rockhound?" The editor replied instantly, "Barnard J. Keys—used to be the station agent."

Magee found Keys engrossed with a problem. He had been asked to show his fluorescent rocks at the county fair the next day, but needed a darkroom and had not been able to hire anyone to build it.

"Okay," said Magee, "I'll build it."

With Keys helping, he worked most of the night, and when the fair opened in the morning the darkroom was ready and the exhibit in place. Magee then stayed on three days to act as barker, and the rocks attracted 2,500 persons.

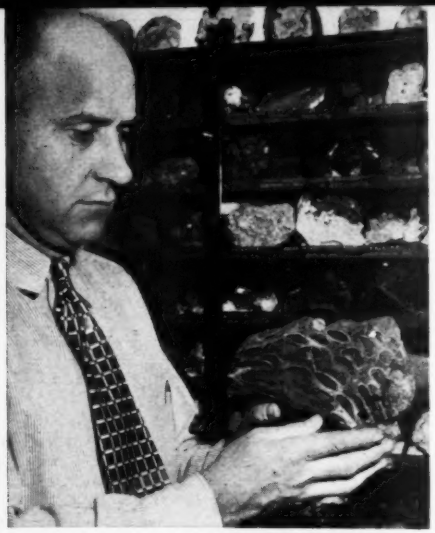
Rockhounds have made many contributions to the great rock and mineral collections in such cities as Washington and New York. The Canon City, Colo., Geology Club always has one or more scientific projects afoot. One of these projects was to locate the original diggings of the Marsh-Cope expedition of 1870, which uncovered the first complete dinosaur remains. The club also has found a dinosaur in its own right: the 35-foot-long, nine-foot-high stegosaurus now in the Denver Museum of Natural History.

CARVING OUT A NUGGET of fool's gold from a slab of Nebraska shale. Colorado rockhounds kick stones like this aside, but in Nebraska, where minerals are scarce, they are treasured.

Nebraska is now engaged in a legal tussle with two rockhounds over a six-foot tusk and a six-pound tooth, said to have come from an Ice Age elephant. They were turned up by a grading crew. An official of the state museum at Lincoln then visited the site and sealed it in the name of the state. A month later, the sheriff heard that the site had been dug into, and caused the arrest of a farmer and a tavernkeeper. After a spirited hearing, they were fined $10 each and ordered to turn the fossils over to the state, but they have appealed.

No Age Limit

Rocks are a hobby adjustable to almost any age, condition or inclination. Collecting can be as mild as a stroll on a Maine beach or as rugged as a camping trip in Death Valley. Collecting may cost noth-



EVERY ROCKHOUND HAS HIS DAY, and Sharpe Osmundson's came when he found this piece of rare petrified cycad wood in South Dakota. Behind him are some of his 2,000 specimens.

ing, or just as much as you want to spend.

A Denver grandmother who must use a crutch never misses a field trip. A Dumas, Tex., man interested his wife in rocks to ward off a nervous breakdown. Rock cutting and polishing are part of psychiatric treatment at the famous Menninger Foundation in Topeka, Kan., and are being used to help patients at veterans' hospitals.

The Nebraska Gem and Mineral Club, at Omaha, now has 70 members, ranging in age from 3½ years to 79. On a field trip 60 miles up the Missouri River one Sunday, the club members walked through a barnyard amid grunting and disapproving sows, climbed over a wire fence, and advanced through long grass and sticky weeds to the top of a hill. There they found rock slabs which, when cracked with a pick-ended hammer, revealed fossilized leaves that had been imprisoned for a hundred million years or so.

The leading collector that day was a "pebble pup," 12-year-old Tommy McDowell, who obtained 70 specimens. His parents say rockhounding solves the problem of a boy's spare time. Seventy-nine-year-old Edward F. Andrews has found that it also solves the problem of the retired. He collected cacti until he had 150 specimens, and his house wasn't large enough for them to be taken in for the winter. At the urgent suggestion of his wife, he then switched to rocks.

Stone Carvings Are Fantastic

There are specialists among rock collectors. Some go in strictly for jade, some for petrified wood, others for agate—or special kinds of agate, such as scenic, which, when held to the light in a certain way, will reveal landscapes, cloud effects, houses or chorus girls.

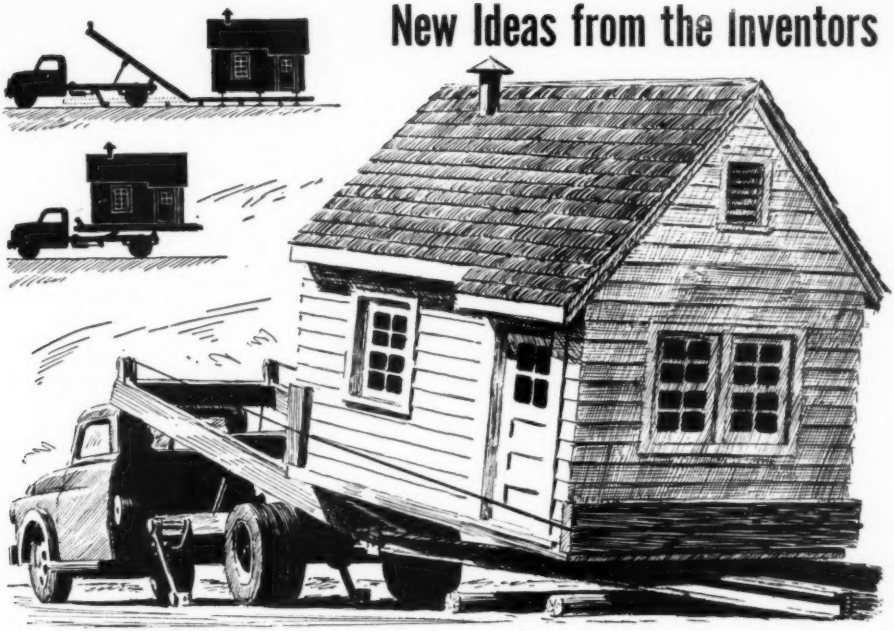
And the things rockhounds do with their discoveries range from the simply amazing to the absolutely astounding. Lathrop G. Hoffman, son of Paul G. Hoffman, president of the Ford Foundation, made a mineral chess set, the board of jade and the men of agate.

This set off a chain reaction in the lapidary world. Mabel Grouard and her husband of Santa Ana, Calif., put in 700 hours and came up with a chess set that symbolizes the struggle between the Christians and Moslems at the time of the Crusades. The squares of the board are black obsidian and red jasper. The pieces have agate bases, the pawns carry swords or scimitars, the rooks are agate, travertine and jade watchtowers or minarets, the knights and bishops bear silver crosses or stars and crescents, and the kings and queens are carnelian columns set on agate bases with silver trimmings.

Mrs. Genevieve Colony of Sacramento, Calif., made a rock map of the United States. Each rock in it came from the state whose name it bears—alabaster from Colorado, coral

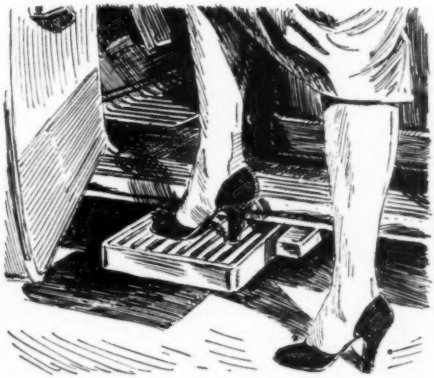
[*Continued on page 248*]

New Ideas from the Inventors



1 Truck to Carry Houses. This rig would make it practically as easy to move a house as to move out of one. Truck rails, driven by a rack and pinion, would slide under a jacked-up house. A winch and cable would pull the building over the rails and onto a hydraulically raised truck bed. Then the rails would be retracted and the truck bed lowered to support the structure on the trip to its new location.

2 Chest Support to Steady Camera. An adjustable bracket resting on a photographer's chest would help him to hold his camera firmly. The bracket would attach to the camera's tripod screw and could be raised, lowered or angled. A neck strap, to be used with it, would free the photographer's hands.

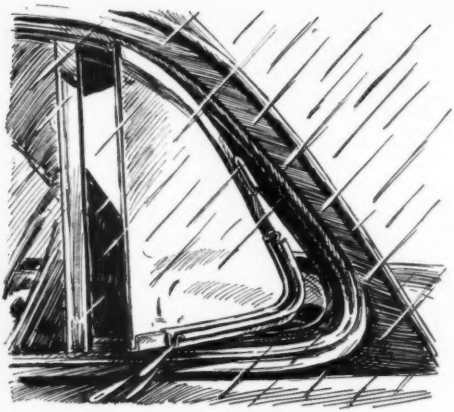


3 Car Step to Slide Out. Some people find it hard to get in and out of sleek new cars whose running boards have been shaved away. This retractable step would solve the entry problem—and scrape mud off shoes—without sacrificing style. It could be either foot-operated or automatic, opening and closing with the door.

Please turn the page for more new ideas.

MORE New Ideas from the Inventors

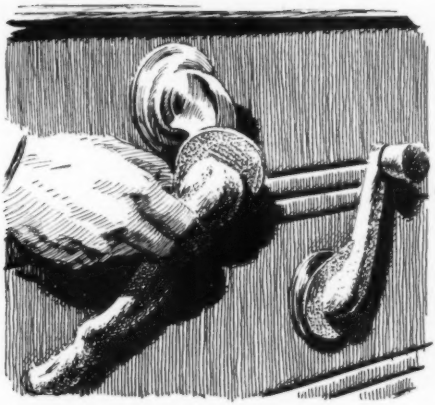
4 Record Bank to Teach Thrift. A children's record having hollow space between the two faces would make saving more fun. Recorded songs and stories would encourage saving, and the broad rim would be slotted to receive coins. Flanges molded on the rim and one record side would lock and unlock the bank.



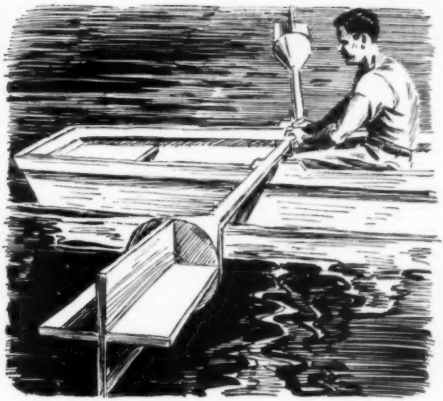
5 Trough to Deflect Rain Drips. Your car's side vents wouldn't spill rain onto your lap if they had these gutters to route drippings outside. The rain troughs would clip to the metal trim without interfering with normal window operation. They could not be unclipped or stolen while the window was closed.

8 Belt Clip to Carry Golf Club. This clip would act as a fill-in caddy for your one-club practice rounds or in regular games when you needed both hands to light a cigarette or keep score. It is designed to hook over a belt and hold a club, head up, at an easy-to-carry angle.

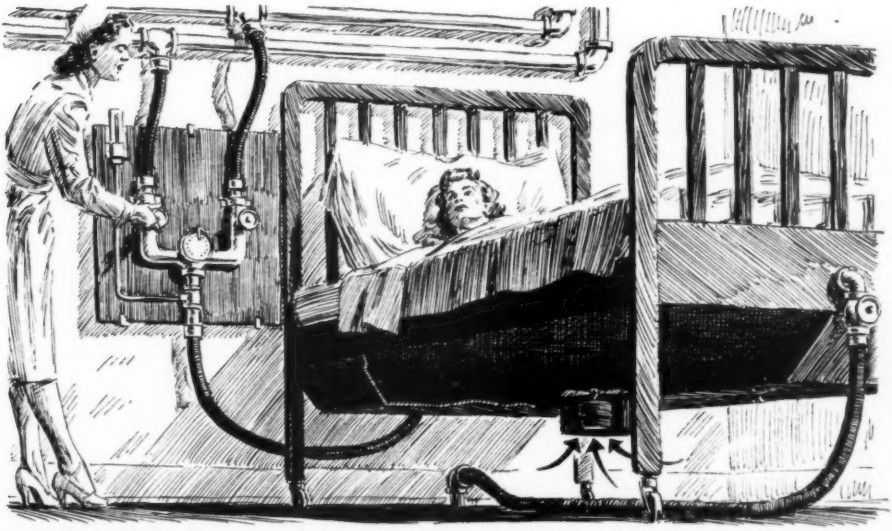
9 Reel to Land Hooked Fish. A semi-automatic fishing reel would help deep-water anglers to land the big ones. The tug of a hooked fish would trigger the power-driven reel mounted above the fisherman's platform. The reel would pull the fish aboard, then drop it to the deck.



6 Insulators to Stop Car Shocks. Those unpleasant tickles you feel when you touch car metal are static electricity, generated by air friction on a moving car and by clothing rubbing against upholstery. Thin rubber insulators to sheathe window cranks, door handles and other exposed hardware would stop the shocks.



7 Oars to Grip Water. These four-bladed oars wouldn't slip, sink or throw you off your stroke by skimming out of the water. The crossed blades would pocket water no matter which way you turned them, and the cone-shaped air chamber near each blade end would buoy the paddles to float just below the surface of the water.



10 Bed to Warm or Cool Patient. Water ducts built into a hospital mattress would circulate hot, cold or mixed water of any desired temperature. A fan under the bed would force chilled or heated air through porous sections of the mattress. The movable bed would be connected to inlet and drain pipes by flexible hoses.

Patents on these inventions have been granted to: 1. J. Holland, Los Angeles; 2. A. Juliano, Kansas City, Mo.; 3. J. Shuck, Corydon, Ind.; 4. J. Byrne, NYC; 5. R. Mauck, Detroit; 6. C. Talley, Levelland, Tex.; 7. S. Jackson, Georgetown, Tex.; 8. C. Payne, San Antonio; 9. R. Deskin, Costa Mesa, Calif., and C. Savitz, South Euclid, Ohio; 10. W. Tolen, Riverside, Calif.

Wilbur Shaw Tells

Why a Rolls-Royce Costs $10,000

REPORT FROM THE

DRIVER'S SEAT...

Built to go 100,000 miles between overhauls, it has the finest craftsmanship that money can buy.

By Wilbur Shaw

THEY tell a story along New York's automobile row about the man who bought a Rolls-Royce and promptly telephoned with a complaint. A serviceman was sent flying to the customer's door.

"Something wrong?" asked the mechanic.

"There certainly is!" snapped the new owner of the Rolls-Royce. "The clock ticks too loud!"

His real gripe was against the low noise level of the car's machinery. A Rolls-Royce is so quiet that with the window vents closed to shut out wind you can hear the rustle of a paper all over the interior of the car at 60 miles an hour. No wonder the clock ticked too loud.

BOTTOM-HINGED TRUNK LID has straps to hold additional luggage in open position. Spare tire is in separate compartment below trunk. Big gasoline tank takes 21 U. S. gallons.

IN THE BEST BRITISH TRADITION, the Silver Dawn comes with a full complement of tools, each in its own receptacle in a drawer which opens only to the owner's key.

The Rolls-Royce Silver Dawn is in its element on New York City's fashionable Park Avenue.

I've just driven a new Rolls-Royce, and I'd like to tell you not so much about its performance—which, except for the braking, was nothing out of the ordinary—but why a Rolls-Royce costs $10,000 and up. That ain't hay.

The Rolls-Royce is termed by the manufacturer "the best car in the world." Thousands of owners will testify that the claim is valid. The Rolls would be just another automobile except for the fact that it's built like a fine watch. It doesn't have much in it that other cars don't have. Like most European cars, it's even underpowered by U. S. standards.

But where except in the Rolls-Royce can you find a car that will go 90,000 to 100,000 miles before requiring a piston-ring job and 150,000 miles before a cylinder rebore? Where, except in the Rolls, can you get a three-year guarantee on the frame and working parts and a one-year guarantee on the body?

And where, except at the Rolls factory,

STURDY DESK folds out of the back of the front seat. I fiddled with it for 10 minutes, enjoying the beauty of the trick hinging. The soft ride lets you write while traveling.

THE OPEN SKYLIGHT is a British institution. And, with Rolls, so is a generous use of aluminum. The Silver Dawn's hood is aluminum, and the body is extra-heavy-gauge steel.

THE HAND THROTTLE in the middle of the steering wheel is something you don't see very often any more. The ride-control lever, also located here, governs the size of the "bleed holes" in the shock absorbers. The wood instrument panel is made of polished South African walnut. So are the trays for the passengers in the rear seat.

are customers permitted to shoot guns at automobile window glass to be sure it's bulletproof? The number of the world's big shots who ride behind Rolls-Royce bulletproof glass would surprise you.

You can get anything you like in a Rolls-Royce if you want to pay for it. One purchased by an East Indian prince has gold window cranks, diamond-studded brocade upholstery, a cocktail cabinet and a ladies' manicure cabinet. Another, also sold to an Indian prince, was equipped with a bathroom. It had all the accouterments but a bathtub—and he probably could have had that, too, if he had wanted it.

A new $17,000 Rolls bought by my good friend James Melton, the singer, has indirect ceiling lights, a sandwich compartment in the right front door, and a set of luggage that is made of the same leather as the upholstery.

The tradition of the exotic, custom-built car, which is to the Rolls what ham is to eggs, is precisely, however, what the company is trying to live down today—at least on this side of the Atlantic. I discovered that when I called at the offices of the U. S. agent, J. S. Inskip, in New York, to pick up the newest of the Silver Dawns.

You Drive, Not Your Chauffeur

The Silver Dawn is the smallest and least expensive of the Rolls-Royces. It retails for slightly more than $10,000 in the U. S. The Silver Wraith (Rolls likes to endow its cars with ghostly names) is the best known of the company's line of cars and sells for $14,000 to $16,000, depending on how

FACTS ON '52 ROLLS-ROYCE

Model: Silver Dawn four-door sedan.

Engine: 6-cyl. F-head; 31.4 bhp. (RAC rating); compression ratio, 6.4:1; piston displacement, 278.5 cu. in.; bore and stroke, 3⅜" by 4½"; seven main bearings.

Weight: 4,200 lb.

Transmission: four-speed synchromesh; rear-axle ratio, 3.72:1.

Steering: 2½ turns lock to lock; radius of turning circle, 22½'.

Effective brake-lining area: 186 sq. in.

Springs: front, coil; rear, extra-long semi-elliptic.

Outside dimensions: height, 64½"; overall length with bumpers and guards, 192"; width, 70"; wheelbase, 120"; overhang, front 27", rear 47"; tread, front 56½", rear 58".

Inside dimensions: seat-cushion width, front (two separated seats) 24" each, rear 55"; leg room, front 54" maximum, rear 35" maximum; headroom, front 35", rear 33½"; seat height, front 12½", rear 15"; vertical distance, steering wheel to seat cushion with seat in mid-position, 6"; front-seat adjustment, horizontal 8", vertical none.

Tire size: 6.50 by 16.

much custom work the customer wants.

A few years ago an American writer dubbed the Rolls-Royce a "nabob's chariot," and the company has been smarting at this dig ever since.

"You see," I was told by a factory representative, "we don't want to be known as the people who build 'passion wagons.' The Silver Dawn is a standard car. It isn't built to be chauffeur-driven. It's built to be owner-driven."

I looked it over. The coachwork was exquisite. So were all the mechanical details. After 10 years of use you could run a damp cloth over the engine, and it would look like new. That's because it has a baked-enamel finish.

I started the engine. It caught, then seemed to die. I looked questioningly at my tutor.

"It's going," he said. "You just can't hear it."

It was going, sure enough. A tap on the accelerator pedal proved it.

Brakes Are Phenomenal

In the next few hours I enjoyed the experience of driving a car almost too smooth for comprehension. That's what $10,000 buys. It reached 90 miles an hour readily enough on a speedometer that, I was assured, was only a fraction of a mile an hour off.

It accelerated through gears from zero to 60 miles an hour in 17 seconds, which was good. It stopped from 60 miles an hour—believe this or not—in 107½ feet, some 90 feet shorter than the book calls for. The car was as solid as a rock on hard curves.

But all that was only incidental to the story of the Rolls-Royce.

What really interested me was the precision of the workmanship. The sharpest ear can't detect a whisper from the transmission through any of the gear changes. There's a reason. These gears are mated and numbered at the factory. Installed in a car, they are tested with a stethoscope on the open road. Only this particular set of gears goes together. Break one gear, and you replace them all with a freshly mated set. The factory insists on it. That's what you get for $10,000.

Company Has Rigid Standards

The legends about this car are rooted in fact. The saying goes that if a Rolls starts out of the factory in anything but perfect condition, the gatekeeper himself will stop it. Only recently 150 out of a batch of 200 wheels were held back for further tinkering because they didn't meet Rolls standards.

Every car is road-tested for 300 miles before delivery. And do you think a cotter pin in a Rolls is just slipped through and spread? No siree! The legs of the pin are then nipped off down to an exactness of 1/32 inch.

Every nut, bolt and screw in a Rolls is cadmium-plated to forestall rust. That is, except the screws in such places as the doors. They're chromed. Each of the six cylinders has a chrome-steel sleeve insert three inches deep. That accounts for a bare half-thousandth of an inch of cylinder wear in 100,000 miles.

Each Rolls engine is broken in at the factory. Buy it off the showroom floor and go

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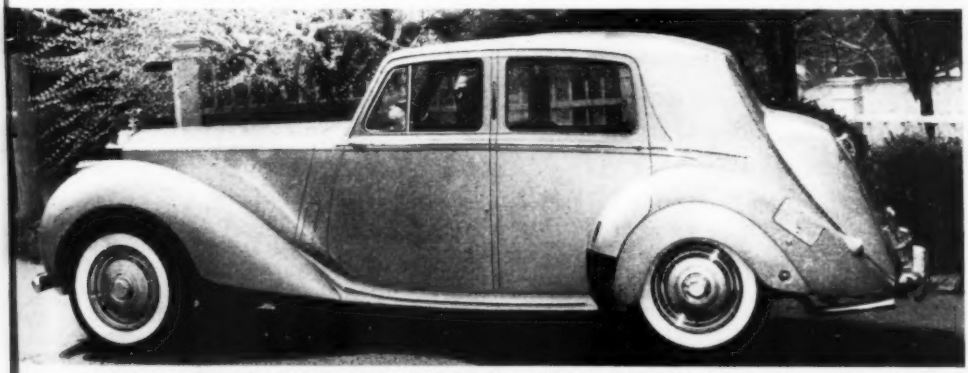


THERE IS A CERTAIN ANGULARITY to Rolls styling, shown in the hood and crowned fenders. That rear-wheel skirt, or "spat" as the British say, swings on hinges for tire changes.

Scooter Scoots to the Water, Then Scoots Over the Waves

THIS pontoon float turns an ordinary scooter into an amphibious job. The scooter is bolted to the float with the rear wheel riding against two rollers. You step on the gas, the scooter wheel turns the rollers, and the rollers drive a propeller. An Italian invention, the Hydro Scooter was shown at the Milan Industry Fair.

Pilot Builds Patchwork Car

CAPT. E. F. SLOAN, an airline pilot, built this fancy, $6,000 convertible in his Seattle basement. He started with a 1940 Ford chassis. A 1950 Cadillac engine supplies 175 hp. through a Ford transmission with Lincoln gears to a two-speed Columbia rear axle. Fenders are from a 1950 Buick and the air scoop from the rear window of a 1935 Ford. The roadster hits 110 m.p.h.

Planes Ride Conveyor "El"

RIDING an "elevated railway," fuselages for the Navy's P2V Neptune patrol bombers travel from station to station on the assembly line. They are attached to wheeled frames which roll along the raised tracks. Under the tracks are air and electrical lines to power hand tools. Across the aisle are bins for parts. The system is installed at Lockheed's Burbank, Calif., plant.

Recordings Check Car Noises

A JURY of "ears" listening to sounds recorded in a moving car may help make automobiles more quiet. A microphone hung at ear level (right) picks up sounds as a driver or passenger hears them. A second mike under the hood detects fan noises and one near the wheels catches pavement rumble. The jury—engineers, designers and average drivers—auditions the recordings in a soundproof room.

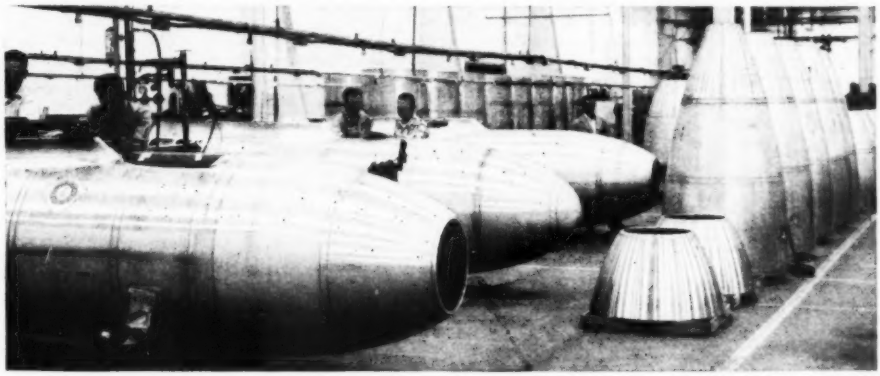
The Chrysler test proved that one noise might be objectionable while another, equally loud, would not. Increasing the speed of a cooling fan, for example, made a big difference to listeners even though the loudness was little changed.

Hot Gears Help Test Lubricants

THIS radioactive gear, direct from the atomic pile at Oak Ridge, will tell which oils offer best protection against wear. Lubricated with various types of oil, it will be run meshed with an ordinary gear in the Shell Oil laboratory. As microscopic bits of "hot" metal wear away, Geiger counters on the oil stream will measure them, accurately indicating wear.

Giant Wing Tanks Will Give Bombers a Longer Reach

BIGGEST external fuel tanks ever made, the torpedo-like structures below are rolling off assembly lines at the Ryan Aeronautical Co. San Diego plant. Their capacity has not been announced but each will gulp down a record-breaking quantity of gasoline or kerosene to give our big bombers extra-long range. More than 30,000 electric spot welds join aluminum alloy sheets to form the lightweight cylinders.



Boards from Bark Save Wood

New process makes high-quality hardboard from slabs that used to be burned as waste.

MEAT packers boast that they use every part of a pig but the squeal. Now lumbermen have gone them one better: They use every part of a tree—even the bark.

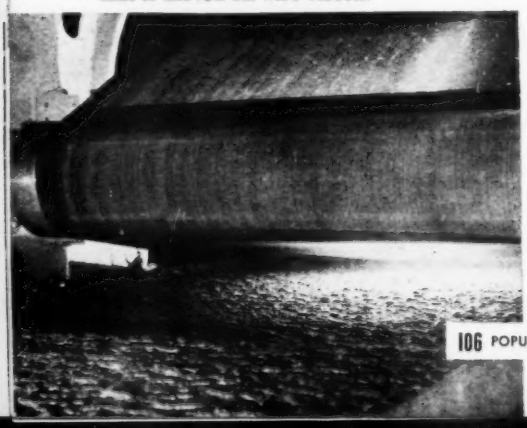
A new $3,000,000 mill at Dee, Ore., grinds up bark slabs that once would have been burned as waste, steams the chips to a stringy paste and squeezes it into sheets of hardboard.

Other mills make hardboard from peeled logs by cooking the wood under high pressure, then "exploding" the fibers by suddenly releasing the pressure. When that was tried with bark, the fibers were shredded so fine they wouldn't dry and drain.

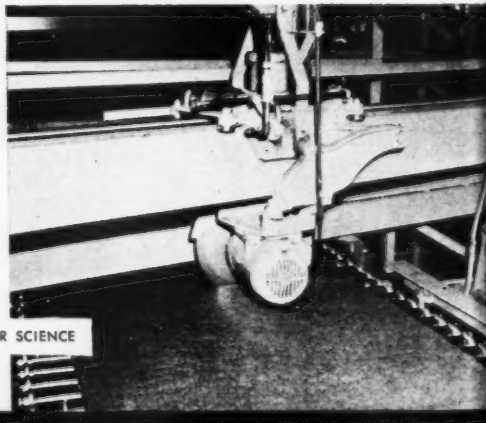
The new process, developed by the Oregon Lumber Co., solves the problem by using less pressure. Thus it not only helps to conserve the nation's dwindling timber supply—trees are 10 percent bark—but also, by using less electric power, cuts production cost 15 percent.

1 WASTE SLABS, cut into four-foot lengths but with bark still on, are dumped from conveyor chain into chipper hopper. Here, whirling knives slice slabs into small chips.

3 COOKED FIBERS are now made into continuous, feltlike wet mat. Mat is one inch thick for each ⅛ inch of finished board. Below, mat is moved on wire screen.



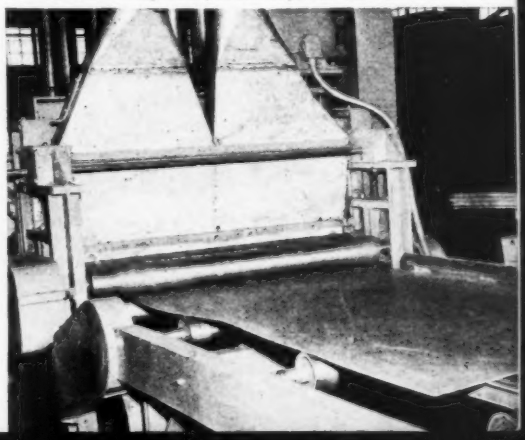
4 WET MAT, traveling about 35 feet a minute, is next cut into 16-foot panels by offset, synchronized wet saw. Mat will now go to the board-forming machine.



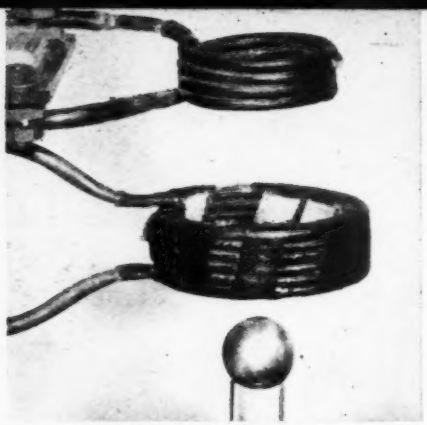
2 FROM A REVOLVING TABLE in this huge storage bin, slab chips are poured onto conveyor belt (right above) for trip to defibrator, where they will be cooked for a minute at 140 to 170 pounds' pressure. Softened chips then are dropped into grinding chamber, where the same pressure is maintained, and are reduced to fibers.

5 HOT PRESS bakes mat at temperatures up to 410° and pressures up to 750 pounds. After 10 minutes, natural waxes and resins in pulp bond fibers into strong board.

6 FINISHED HARDBOARD comes out between rollers of trim saw. The ¼-inch board shown has been trimmed, edged and brushed. Board has many uses, from toys to trucks.



Metal Melts as It Floats in Air

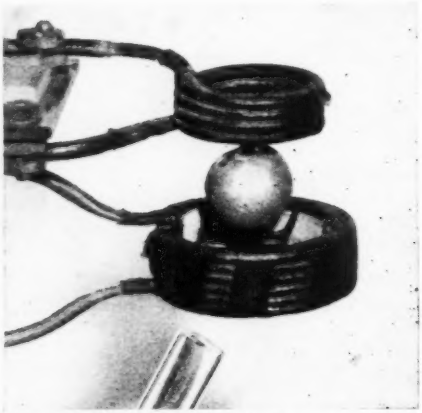


TO DEMONSTRATE FLOAT-MELTING, glass rod brings solid aluminum ball into coils' field.

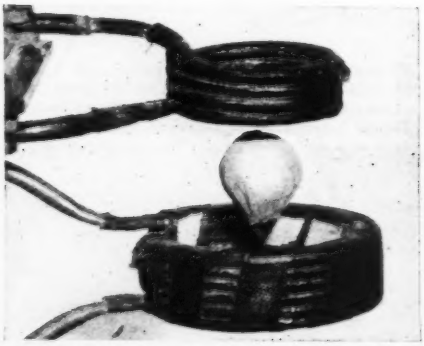
OUTDOING stage magicians, scientists now make metal float in the air while they melt it. A piece of brass, tin, aluminum, molybdenum or titanium hangs unsupported in the magnetic field of two current-carrying coils, and induction heating liquefies it. Then a current control relaxes the coils' magnetic hold—and hot and molten, or cooling and mushy, the metal falls into a receptacle.

This "float-melting" method produces purer metals and alloys because it requires no crucible, thereby eliminating contamination from the crucible's own material. Westinghouse research men, who developed the new technique, have applied it to chunks of aluminum as big as four inches long and 2½ inches in diameter.

A possible future application could be to study substances' behavior at hotter temperatures than the toughest crucibles can withstand. Until now, extreme-high-temperature experiments with material in any bulk have ended abruptly, when the crucible itself melted or vaporized.



BALL LEAPS FROM ROD and floats in air. If poked aside, it springs back to position shown.

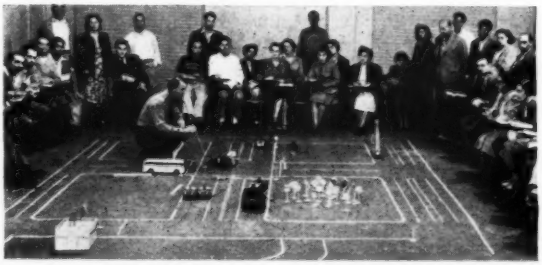


TAKING SHAPE OF PEAR as it melts, metal stays suspended until dropped into receptacle by reduction of coils' current. Alloy ingredients may be added to "melt" floating in mid-air.

FLOAT-MELTING OUTFIT liquefies metals either in open air or within glass vacuum chamber (on table in photo). Specimens weighing as much as 19 ounces have been melted in trials.

This Hammock Travels with You

After playing hard and packing in the food on a picnic, you might want to stretch out for an afternoon nap. So a manufacturer in Scotland has come up with a portable hammock (right above) that eliminates the search for a soft spot to lie down in. The whole thing folds for carrying into a combination back pack and shoulder bag as shown at left above.

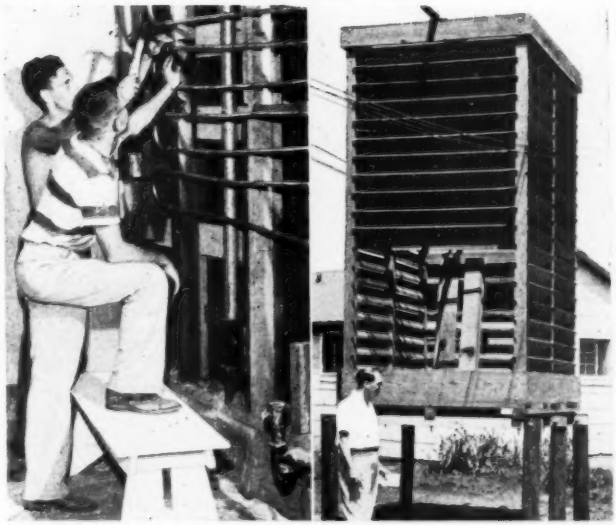


Toy Cars on Sticks Teach Driving Rules

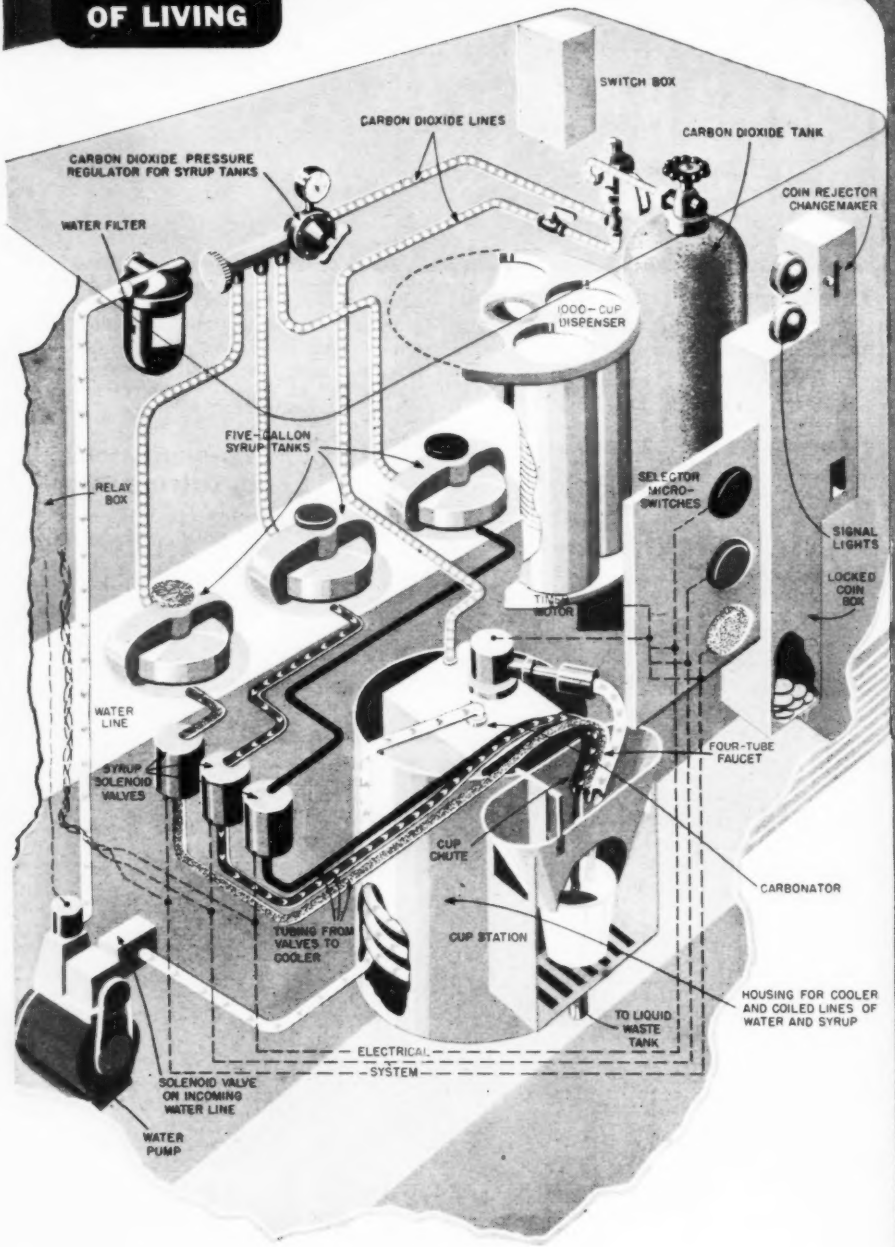
By pushing toy cars over roads chalked on the floor, these new drivers are learning safety rules before they ever sit behind a wheel. The school is run by the California State Highway Patrol, which says the system cuts down learners' accidents.

Cold Water in Heating Pipes Cools Oklahoma House

The pipes that heat a house in winter will also help keep it cool in summer, in a system developed by Prof. R. R. Irwin of the Oklahoma Institute of Technology. The system is intended for use in hot, dry climates with the type of radiant heating that has pipes in ceiling and baseboard. Additional pipes are added to the walls. Water circulating through the pipes is cooled by evaporation in a water tower similar to the one at far right. In a test, a housing unit was kept at 76° when the temperature outside was 102°.



MECHANICS OF LIVING



How a Robot Soda Jerk Works

THIS automatic soft-drink dispenser can't kid the girls and discuss baseball scores with the men, but it does practically everything else that a live soda jerk does.

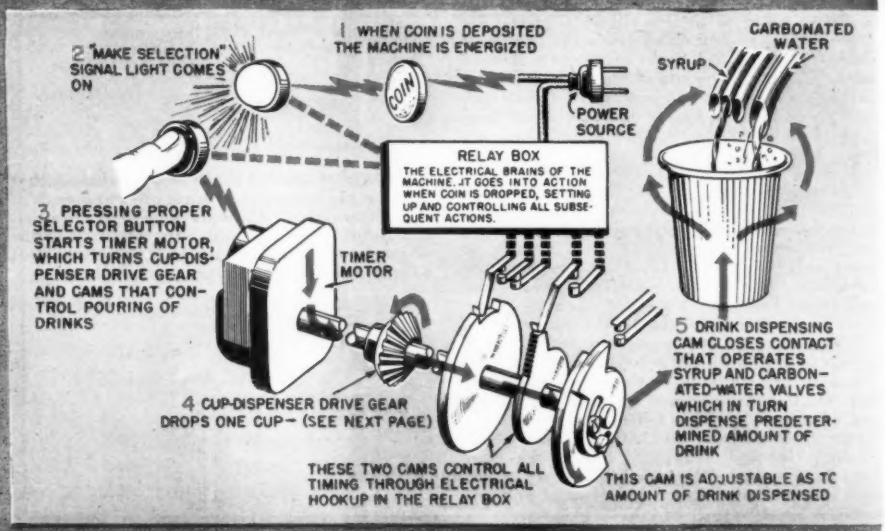
It rejects slugs and foreign coins, makes change, gives the customer a choice of three flavors (a forthcoming model will provide six), sets a cup before him and then proceeds to measure out, mix and pour the drink he selected.

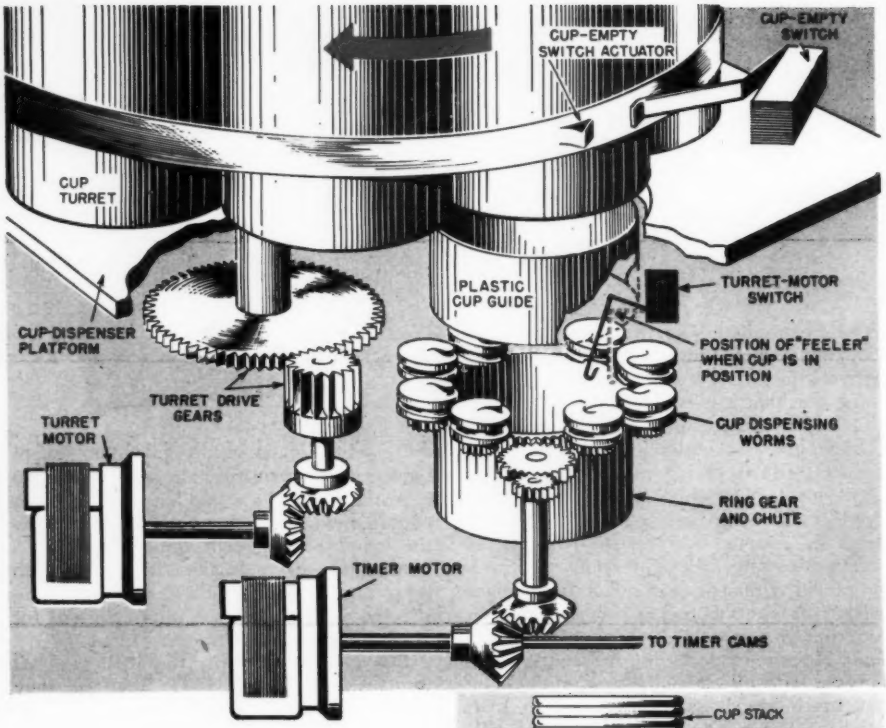
The drawing below provides a highly simplified explanation of what takes place when you drop a nickel, dime or quarter into this multiple-flavor drink dispenser—a Soda Shoppe, made by the Automatic Products Co., a leading manufacturer in the field. The machine makes change in nickels only.

The drawing on the facing page shows the essential parts of this machine, except for the cup-dispensing unit, which if drawn in working position would have hidden other parts. Drawings on the next page show how the cup-dispensing unit works.

A darker color makes it clear which syrup tank, solenoid valve and tube line are affected when a customer has chosen, for example, to push the center button.

For the sake of clarity the artist also has straightened out the syrup lines as they near the faucet instead of showing them coiled around the cooler, as they are.



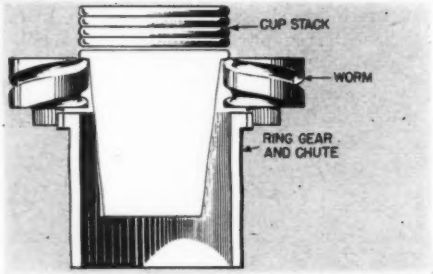


THE 1,000-CUP TURRET (above) is a circle of 10 stainless-steel tubes, each holding 100 paper cups. When the drink dispenser is in use, one of these tubes is always directly above the chute down which the cups travel to the point where they are filled. Eight worm gears around the upper rim of the cup chute, meshed with a ring gear, drop one cup each time a customer puts a coin in the drink dispenser and thus starts the timer motor that turns the ring gear.

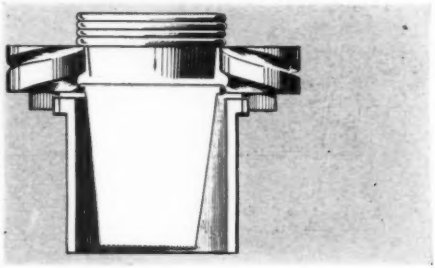
As each tube becomes empty, a little "feeler" in the cup chute, released by the dropping of the last cup, triggers a switch that starts the turret motor. The motor rotates the turret in a clockwise direction far enough to swing a full tube of cups into position over the chute. The bottom cup of the fresh tube pushes the feeler back against the wall of the chute and switches off the turret motor.

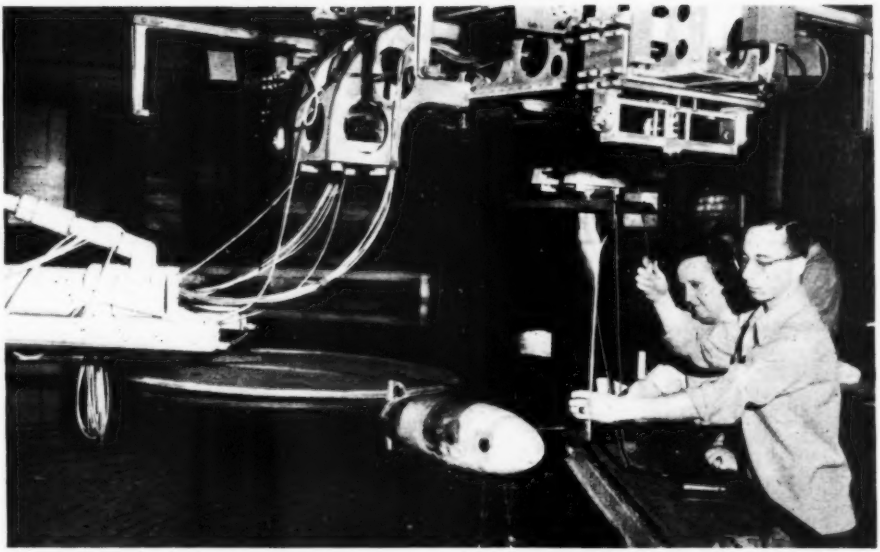
When all tubes are empty, the entire turret has made one complete revolution, and a metal nub on the outside of the steel band that encircles the tubes comes in contact with the arm of a switch. This switch then shuts off the drink dispenser. At the same time a signal light labeled "Empty," beside the coin slot, flashes on. The machine won't work until a serviceman has come around and installed a fresh supply of cups.

Detail drawings at right show how the worm gears drop the cups.



EACH WORM GEAR (above) has a thread that starts at the top, goes around once and ends at the bottom about 35 degrees beyond the starting point. The bottom cup (below) drops when the worms have turned 35 degrees. Rest of turn carries second cup to the bottom.





Blimp Gets Scientific Dunking

DUNK a model blimp in water and you can tell how a big fellow just like it will behave in the air. Better than wind-tunnel testing, underwater towing shows rotary as well as straight-line movements of models. This one, attached to a rotating arm on the overhead carriage, is being tested by the Navy at Stevens Institute of Technology.

75 years ago this month

Popular Science Monthly reported:

"ABOUT twenty years ago parlor-matches began to be manufactured and have ever since been growing in favor. No sulphur is used in them, and in their freedom from odor, their convenience and rapidity in lighting, they have a decided advantage over all others. Their noisy explosion is occasioned by chlorate of potash. They seem to have obtained their greatest popularity in the Western and Southern States, and are used pretty generally among the wealthier classes."

Plastic Tanks Haul Desert Oil

SANDSTORMS that rip off paint and night dampness that corrodes metal won't faze this desert-going oil tanker. Its tanks are made of plastic reinforced with glass fibers. Fifteen such trucks carry fuel and water to remote exploration parties, drilling crews and construction camps of the Arabian American Oil Co. in Saudi Arabia.

Lightweight Plastic Props Dress Up Stage Sets for Television

TV STAGE hands get a break with these new plastic props. They average a quarter the weight of the wood-and-plaster imitations previously used, cost half as much, are waterproof and can't warp, shatter or burn. They can be handled easily, stored in less space and repainted and re-used as often as needed. Studio Alliance of New York City developed the new props for use by the National Broadcasting Co.

Remote Switch Silences TV

THIS switch gives you the upper hand over blaring TV and radio commercials by letting you disconnect the loudspeaker from 20 feet away. TVX Co., 217 Riverdale Ave., Yonkers, N. Y., sells it.

Pencil Counts as It Marks

THIS little gadget counts bomb hits on aerial photos, recording them in numerals on its stem. The stylus revolves under pressure, marking as it counts. It was designed for the Air Force, but will also be useful to researchers for counting blood cells, and in industry for adding up pinholes, words or lines. The Mast Development Co., Davenport, Iowa, makes it.

Tree Gets Shots to Make It Kill the Bugs That Bite It

THIS tree is getting shots to make foliage and bark toxic to sucking insects. Plants also can be protected by spraying the new insecticide on leaves or adding it to soil at the roots. Because Systox is absorbed by plants, rain can't dilute or wash it away.

Field tests with the insecticide have been made on tobacco and cotton plants, food and forage crops. The Pittsburgh Agricultural Chemical Co. is making it.

How to Buy an Antique Car

Don't be fooled by flashy "bargains," which often cost too much to restore. Better start with a Model T Ford.

IN 300 HOURS, Herb Singe and his father have taken apart, cleaned and rebuilt to this stage the 1910 Model T Ford at the top of the page, shown as it looked the day they bought it.

By Wesley S. Griswold

HAVEN'T you ever itched to drive down Main Street in one of those high, wide and handsome cars of 40 years ago? Their paint jobs glisten like patent-leather shoes. Their brass trim glows like gold in the sunshine. Kids run after them in wonder and delight. Older folks stop and stare and exclaim in pleased surprise, "Well, I never thought I'd see one of *those* again!"

Perhaps you've dreamed of an even richer satisfaction: discovering an aged, decrepit, neglected automobile and nursing it back to health yourself.

If you have this kind of hankering, you can hardly do better than follow in the footsteps of young Herb Singe. He is the perfect laboratory model for demonstrating how to collect and restore old cars on an

A BASEMENT BUSINESS in Model T Ford parts is conducted in Brooklyn by William Scharff, 80, who has sold them since 1915. Ignition switches, once costing 40 cents, are rarest items.

income that is not above the average.

Herb, who lives in Hillside, N.J., is a lanky, 25-year-old former aviation machinist's mate in the Navy (1944-46). Still single, though engaged to be married, he resides with his parents and sells and services Addressograph machines for a living. He and his father have been building things together—radios, furniture, model trains, model planes, model cars—ever since he was a small boy. Whenever a birthday or Christmas was approaching, both of them asked for tools. As a result, the Singe cellar is now full of them—circular saw, bandsaw, six-inch metal lathe, drill press, arbor press, acetylene welding equipment, and electric hand grinders, polishers and drills.

THIS 1915 FORD cost its owner, H. Austin Clark Jr., $250. Even though it was in prime condition, he spent another $250 restoring it for his old-car museum at Southampton, L.I.

Herb didn't start out with the idea of collecting old cars at all. He had an itch to find almost any kind of distinctive mechanism in rundown condition and make it look and run like new. He couldn't afford much, but he wanted something entirely different. Hot rods, he felt, were becoming too common.

Extra Model T Serves as Guide

One sweltering summer day three years ago, he met and immediately fell in love with a dejected-looking 1923 Model T Ford coupe. The sign on the dirt-streaked windshield read, "For Sale—$65." The car would run, but he had no idea how to drive a Model T, so he towed it home.

Without knowing it, he had made the ideal choice for the start of an old-car collection. There were 15,000,000 Model Ts made between 1908, when the car made its debut, and 1927, when the Model A was introduced. Therefore, they are quite easy to find and, accordingly, inexpensive. Parts for them are available, which is not true of most other old cars, and in many cases are interchangeable among models over a wide range of years. Model Ts can be restored without much strain by anybody even modestly gifted as a machinist. Finally, when

the restoration is done, they are attractive, sturdy, untemperamental.

Herb Singe had barely had time to examine his $65 Model T when he discovered another one. This one was on sale for $25. He figured it would come in handy for spare parts, so he hauled it home, too.

His first move was to take both cars completely apart and throw away everything that could not be salvaged. He wound up with the chassis, block, front axle, and rear-end housing of the $65 Ford. He also had its ignition switch, a rare item. Of the $25 Ford, he saved only the engine. It wouldn't run, but it was a valuable guide. He dismantled it entirely and carefully laid out the pieces on the floor of the family garage. In this way he found out not only what parts he needed but how to put them together when he got them.

Parts Turn Up in Odd Places

The hunt for parts would have been a cinch if he had been a member of a fan club, as he is now. It is much easier to locate old cars and rebuild them if you have fellow collectors to hash your problems over with. At that time, however, he didn't know such clubs existed.

By asking questions of garage mechanics and junkmen, Herb managed to round up a stock of Model T nuts and bolts, at $1 a hundred pounds, and a radiator in nearby Newark. But it took a 50-mile trip to obtain lug nuts for the wheels, and splash aprons (curved pieces that prevent mud from splashing up between running boards and body) seemed to be impossible to find.

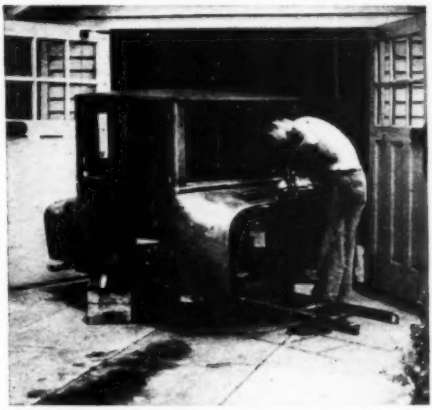
Finally he wrote the Ford people for help, and they sent him the names of two parts dealers. One of them was William Scharff.

Scharff Buys Up Junked Parts

Scharff is a gentle, courteous widower of 80, with pale blue eyes and carefully brushed white hair, who lives under the Elevated at 1322 Myrtle Ave., Brooklyn. Since 1903, he has resided and carried on a satisfactory business within a radius of a few hundred feet.

He was a dealer in Model T parts when the Model A was introduced, and, contrary to almost everyone's advice, he remained one while other dealers dumped their stock. On a single day he went out with a truck and collected eight tons of parts that others were hurrying to get rid of. He soon had

THREE YEARS AGO, Herb Singe learned to drive his first Model T, a 1923 coupe acquired for $65 and lugged home on a trailer. He was then rebuilding the car from the ground up.



STRIPPING OFF PAINT on a spare body that, although 26 years old when found, had never been used, Herb finishes the job with an electric wire brush after using paint remover.

CHECKING THE OIL on the fully restored coupe, with which Herb has won many prizes at meets. A friend is shown opening the lower of two crankcase petcocks with an extension wrench.

the entire stocks of eight dealers and ever since then has been supplying parts to Model T owners. Now there are more than 1,000 names on his pencil-written account books of people who have brought their parts problems to him from all over.

Herb, hunting for splash aprons, found Scharff temporarily out of them, but he came away with four brand-new fenders. He eventually found the splash aprons down at Fort Dix, 50 miles or more from home.

Where Does That Piece Go?

Altogether he spent about $250 on parts, ranging from wires to wheels. One item of $20 was for nickel-plating more than 200 parts, including screws.

He tracked down head and tail lights in Newark. He bought five new 30 by 3.5 clincher-type tires from the local Montgomery Ward store. With tubes, these cost $59. That price couldn't be matched today, though both Firestone and Goodyear still make them. Firestone, in fact, continues to turn out carefully antiqued copies of large, outmoded tires in eight sizes, ranging from 28 by 3 to 36 by 4.5.

Whenever a part had been painted, Herb stripped it bare and repainted it. He even took the leaves of his springs apart, doused them with paint remover, and scrubbed them with a wire brush.

The only major hitch in restoring the Model T came the day Herb was happily preparing to start his newly assembled engine for the first time. He discovered a length of copper tubing lying on his workbench, and a hasty check against the disas-

What the Buyer Should Beware

Luxury cars, electrics and steamers all provide pitfalls for the novice.

BE SURE to select the kind of car that will really give you what you are looking for. Some men, in search of razzle-dazzle and novelty, have wound up with a car that is simply too hard to drive—too many levers for two hands. Others have bought cute little puddle-jumpers—one- and two-cylinder first cousins of a carriage—that didn't have enough vitality to get to meets by themselves and had to be carried on trailers.

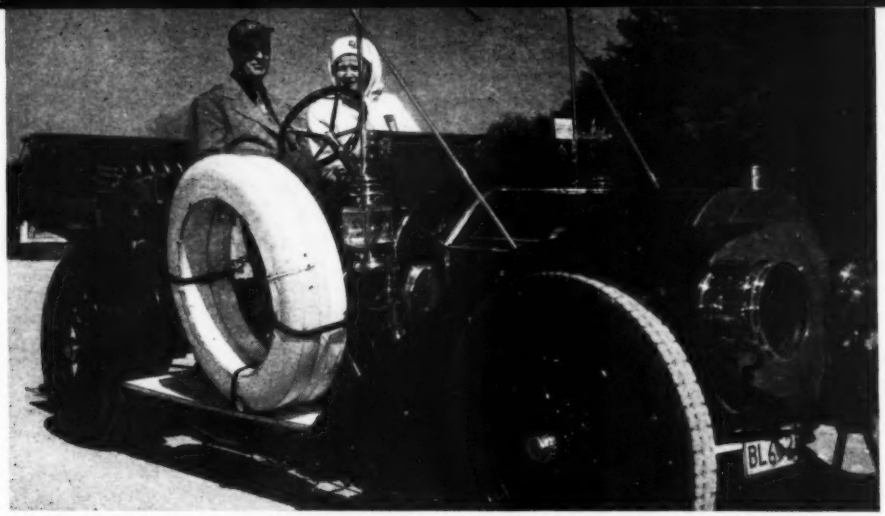
Too many would-be collectors of old cars have champagne appetites and beer pocketbooks. They want to own a Rolls-Royce, a Simplex, a Mercedes, a Pierce-Arrow. They know it is sometimes possible to pick up one of these intricate luxury cars for a few hundred dollars—if it is falling apart at the seams. What they don't realize is that it can easily cost thousands to restore it to perfect condition.

"First-class auto mechanics with years of experience have all they can do to accomplish the job," one highly skilled machinist told me. "An amateur would be hopelessly lost." And restoring the body is a mighty costly undertaking itself.

Barney J. Pollard of Detroit, who owns more old cars—over 600—than anyone else in the world and has restored very few of them, spent $2,500 putting just one back in prime shape. Henry Austin Clark Jr., proprietor of the alluring Automotive Museum at Southampton, L.I., paid $3,000 for a 1907 Thomas that won the 1908 New York-to-Paris race (by way of Siberia), and Clark thinks it is unfitting to restore it. But he says it could cost more than $3,000 to restore an unhistoric Thomas of the same model to first-class condition, provided you could find one.

Some people would like to start a collection with a Stanley Steamer. Clark says this is a foolish and costly ambition unless you happen to be a steam "bug." Others have a hankering for an electric. If you can afford it, well and good, but a set of new batteries will set you back $1,000 to $1,500.

Another important point: "Never buy from a dealer," said Barney Pollard as he waved a crumpled circular at a friend. "Here's a guy offering a Chevrolet 490 for a thousand bucks! It couldn't *possibly* be worth a cent more than three hundred and fifty. You can see how easily a beginner can be rooked."



NO BARGAIN, though it was picked up for $75, this beautiful Pierce-Arrow cost Samuel Baily of Bala Cynwyd, Pa., $4,000 to restore, and he did all the work on the car himself.

sembled engine of the $25 Ford, still laid out nearby, showed it to be the crankcase oil tube. There was nothing to do but partly take down the new engine, install the tube, and put it all back together again—a five-hour job.

When Herb had the engine mounted on the chassis, he taught himself to drive the car by practicing in the family driveway.

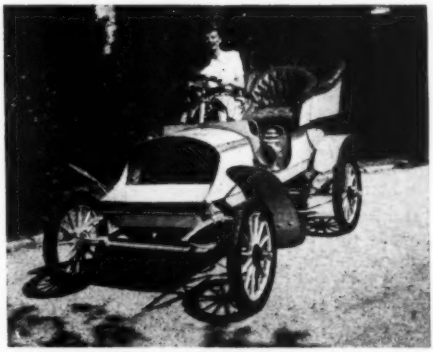
All this while, he had been worrying about the body. How was he ever going to make that sad hulk look spruce again?

Then occurred one of those extraordinary pieces of luck that occasionally mark the course of all collecting. A buddy of Herb's mentioned that he had heard of a man by the name of Morris Chamberlain, up in Chester, N.J., who had a brand-new Model T body in his barn. Herb grabbed up his girl and dashed to Chester that same evening.

Herb Has to Talk Fast

Chamberlain turned out to be a former Ford parts dealer who had hoarded bits and pieces of outmoded machinery and equipment and was reluctant to part with any of them. It took all of Herb's abundant charm to get Chamberlain to admit that he even owned a Model T body. It was for a 1923 coupe. Part of the original crating was still on it. The paint was cracked and faded in places where the suns of 27 years had managed to reach it, but the upholstery, floor mat, back-window curtain, and the windows themselves were in perfect condition.

Up to this point, Chamberlain had re-



EXCITING BUT EXPENSIVE, this four-cylinder, air-cooled 1904 Franklin cost Austin Clark $350 to acquire, more than $2,000 to restore.

AN EYE-CATCHER now is Herb Singe's superbly rebuilt 1904 Olds, in which he is shown with his mother. But altogether it cost him $1,500.

peatedly said that the car body was not for sale. But Herb, standing within reach of what at the moment seemed to him the most desirable object in the world, argued appealingly enough to get it, for the original list price—$100.

Herb soon found that the white-metal rollers in the window-casing mechanisms were cracked, but he machined new ones out of steel on his lathe.

Red Wheels Aren't Authentic

Repainting the body, which was first stripped to its bare metal, was a major undertaking. Herb spent $100 for paint, paint remover, Glass Wax, and other liquids to bring it to a glow. With a paint sprayer, he applied 10 coats of primer, sanding three times before he started putting on 20 coats of black lacquer. The sanding was continued, and the final coat was hand-rubbed until it glistened.

Herb's final touch was to paint the rims and spokes of the wheels red to give the black body a pepping up. After he had become a member of the Antique Automobile Club of America—he is now director of its New Jersey Division—he drove one day to a meet in his shining Model T. Other members laughed at his wheels. "They should be either black or natural," they said, "if you want this car to be really authentic." Embarrassed at his mistake, he did them over, and now they are the color of fine honey.

When the Model T was finished, it had cost Herb $675, including the price of the two beat-up cars he started with. I asked him how much time he and his father had spent on it.

Good Jobs Take Time

"Oh, about a thousand hours," said Herb airily. "But look at all the fun we had!"

Since it was finished, the car has won prizes eight times in meets.

Completing the Model T merely got Herb launched as a collector. First thing he knew he was hot after a 1904 curved-dash Oldsmobile, a basket of scrap metal and four wheels. It took many visits and much of Herb's special pleading to convince the owner to part with it, but he finally did, for $390.

When Herb drew the money out of his savings to pay for the car, his mother wept. She thought he was crazy. But as the car slowly regained its original charm, she began to take a loving interest in it herself, and no one is prouder than she is today to watch it put-put off to a meet, its black-and-scarlet body glistening and its brass lamps gleaming.

The Singes put in 3,000 hours of work in the course of 16 months on the Olds, and Herb spent $1,500 altogether. He started the reconstruction job by taking the whole chassis apart and having it sand-blasted by a tombstone engraver.

There were no bushings in the steering and brake mechanisms, with the exception of the kingpin bushings. Herb and his father filled all the holes with bronze welding, then filed down the surfaces and drilled new holes, reaming them for proper fit. This, and cutting threads on the counterbalance bolts for the flywheel—12 threads to the inch, ½ inch in diameter—were the trickiest machining jobs they had to do.

One big detail was removing the 16 copper tubes from the radiator, along with its

[*Continued on page 222*]

Collectors Learn Fast by Joining a Fan Club

EVERY seasoned collector says the beginner should join a club of old-car fans. There are several small, local clubs. The largest three in the U.S. are the Veteran Motor Car Club of America, in Boston; the Antique Automobile Club of America, in Philadelphia; and the Horseless Carriage Club of Los Angeles. All have chapters elsewhere. In no instance are the dues more than $6.50 a year, nor do you have to own an old car to qualify.

At club meetings you will meet people who can tell you where you are most likely to find the kind of car you want, what you should pay for it, and where you may find parts or have them made most economically.

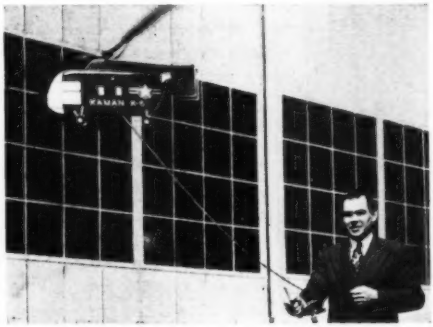
Dry Ice Calms Down Hot-Tempered Well

When an oil well in Texas threatened to blow its top, the drill crew capped it in a hurry, then worked out a gimmick with dry ice to hold it down.

To keep the well under control it had to be filled with heavy drilling mud. But this involved unscrewing the emergency cap, which would let the well blow out.

The only answer was to seal the well temporarily at a second point below the emergency cap, to permit safe removal of the cap and connection of pipes to pump the mud in. But how to plug a well that you can't cut open? With dry ice.

A tiny hole was made and clay and water forced in. Dry ice tamped around the spot froze a solid clay plug and the crew went ahead with repairs.



Model 'Copter Runs on Air

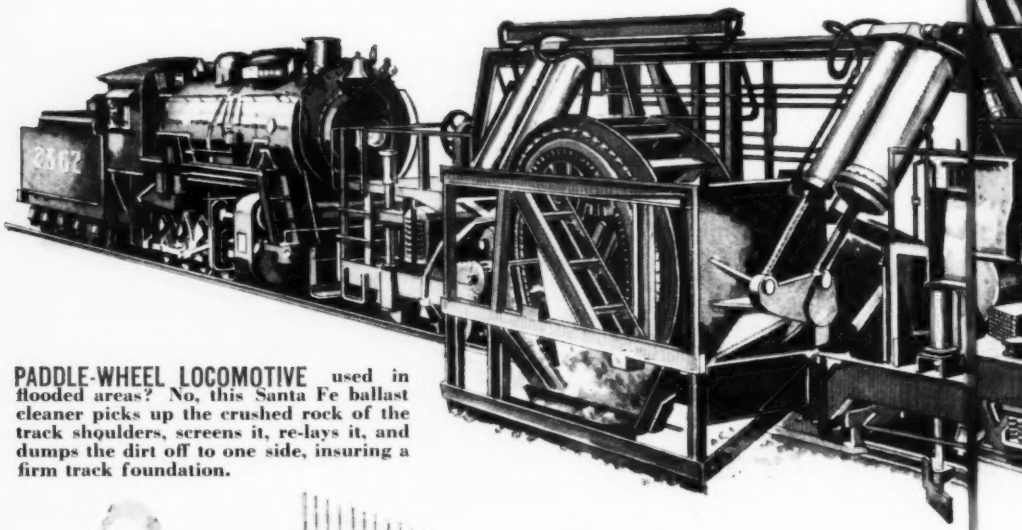
What looks like an expensive toy helicopter is really a flying laboratory for studying jet propulsion. Compressed air fed into the rotor hub travels through metal tubing to supersonic jet nozzles at the tips of the blades. A hand throttle at the end of a 15-foot tube controls the flow of air to the ship once it is aloft. When tests are completed, a full-scale passenger and cargo jet 'copter like the model will be built. Igor B. Bensen of Kaman Aircraft, Bradley Field, Conn., designed it.

Suitcase Packs Oxygen

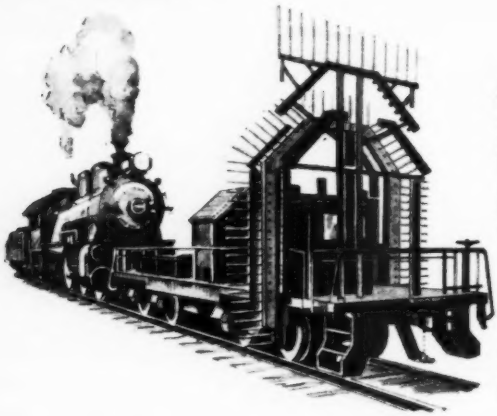
Privately owned planes now can fly higher while pilot and passengers breathe out of a suitcase. It holds an oxygen tank with four outlets (far right), giving a plane a higher ceiling to escape bad weather or to get a boost from tail winds not around at lower altitudes. Made by the Scott Aviation Corp., Lancaster, N.Y., the unit also can be used to treat a heart patient in an automobile.

DRAWINGS BY
Henry B. Comstock

'Rube Goldbergs'



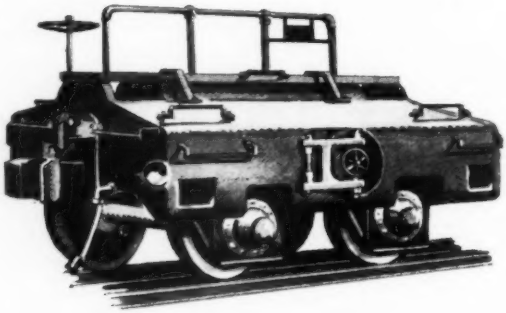
PADDLE-WHEEL LOCOMOTIVE used in flooded areas? No, this Santa Fe ballast cleaner picks up the crushed rock of the track shoulders, screens it, re-lays it, and dumps the dirt off to one side, insuring a firm track foundation.



AMERICA'S railroads own and operate 10,382 cars that don't haul any passengers or freight. Most people never see them. Yet they pay their way. These are the service cars, strange machines on wheels that perform all the specialized jobs involved in keeping the trains running.

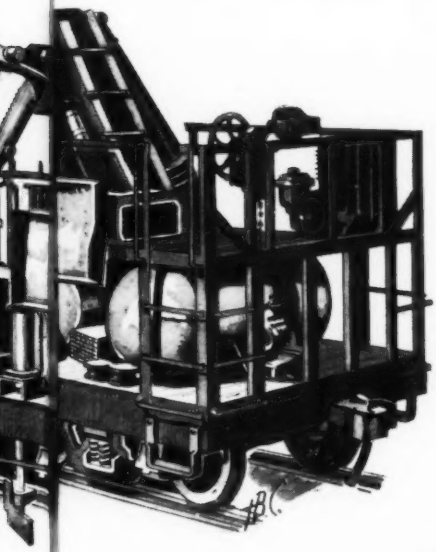
There are small ones—tiny section scooters built to carry one man along the tracks—and big ones—gigantic 250-ton cranes that can lift locomotives. In-between in size are the six strange-looking contraptions shown here. Queer as they look, they're all practical machines in common use.

TELEVISION TEST CAR? You might think so, but those hinged feelers give an accurate report of tunnel, bridge and other right-of-way clearances. The "porcupine car" determines routes for oversize shipments.

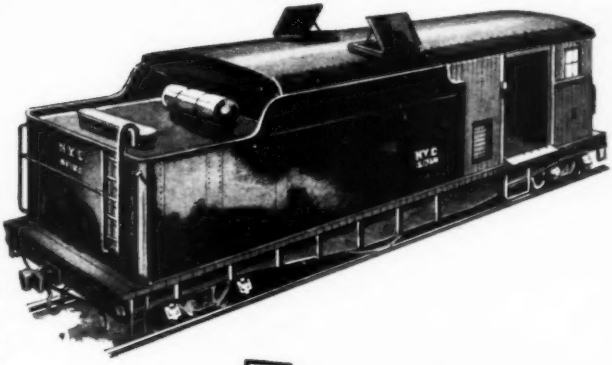


PARK BENCH for rail-traveling hoboes? Maybe. But the bindle stiffs will have to hit the cinders when this carefully weighted and sealed scale-test car is run onto load-weighing platforms to check their accuracy. If test car tips the beam at exactly 40 tons, scale is okay.

of the Rails

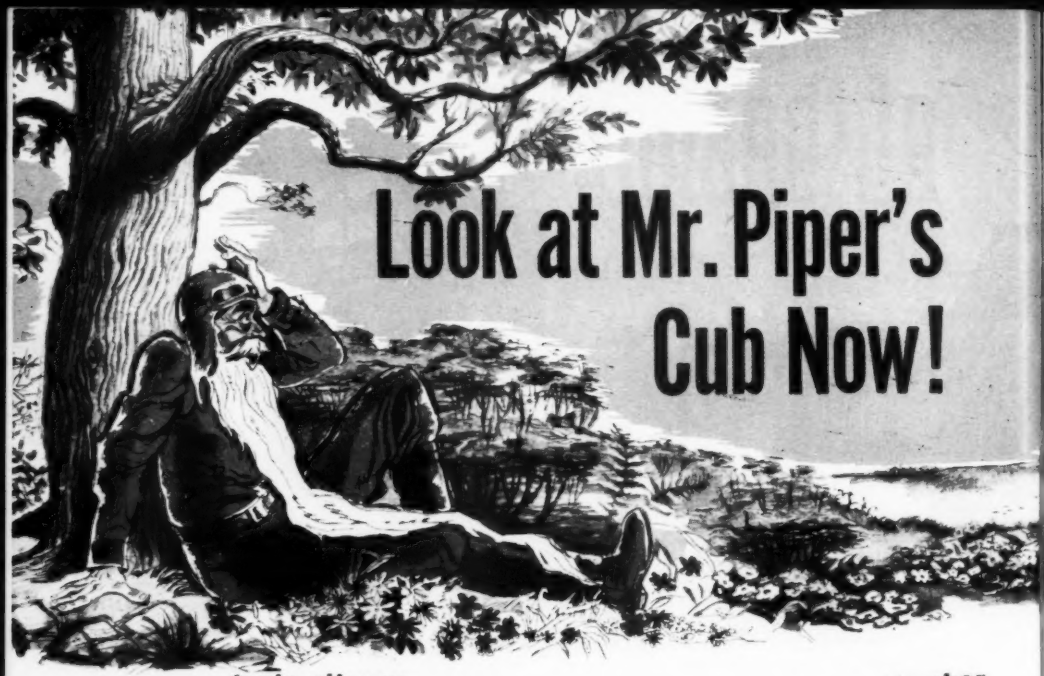


JUNGLE GYM FOR FLABBY FLAGMEN? Wrong again. It's a platform car with a telescoping deck (to allow the car to clear low bridges and tunnels) used by Pennsylvania wire crews to string and repair catenary (trolley) lines on electrified divisions.



NOT A COLLISION. New York Central mounted an old locomotive tender on a flatcar and added a shelter for pumps, chemical equipment and a thousand feet of high-pressure hose. The resulting fire-fighting car is kept on a yard siding, ready to rush to trackside blazes.

MOBILE SWIMMING POOL? Not unless you're a polar bear. Boston & Maine loader tosses snow into tanks where steam melts it.



Look at Mr. Piper's Cub Now!

When private pilot Rip van Winkle wakes from an air-age slumber

By Herbert O. Johansen

REMEMBER the puddle-jumper Cub? It was slow, sluggish and uncomfortable. Its two-place, tandem cockpit was open and windswept. The instruments could be counted on the fingers of one hand with one finger left over. With its 37-horsepower engine, it cruised at 62 miles an hour.

It was the aerial Model T, born to the scorn of many hot-shot pilots back in 1931. But it sold for around $1,000, put the lightplane in the sky to stay and, with its heirs-of-the-air, the Piper J2 and the J3 Cub Trainer, enabled a lot of Americans to learn to fly.

Today the awkward puddle-jumper has grown up to take oceans in its flying stride. Max Conrad has flown the Atlantic in a Piper Pacer, a fancy-pants Cub, and a few years ago George Truman and Cliff Evans flew around the world in a pair of Cubs.

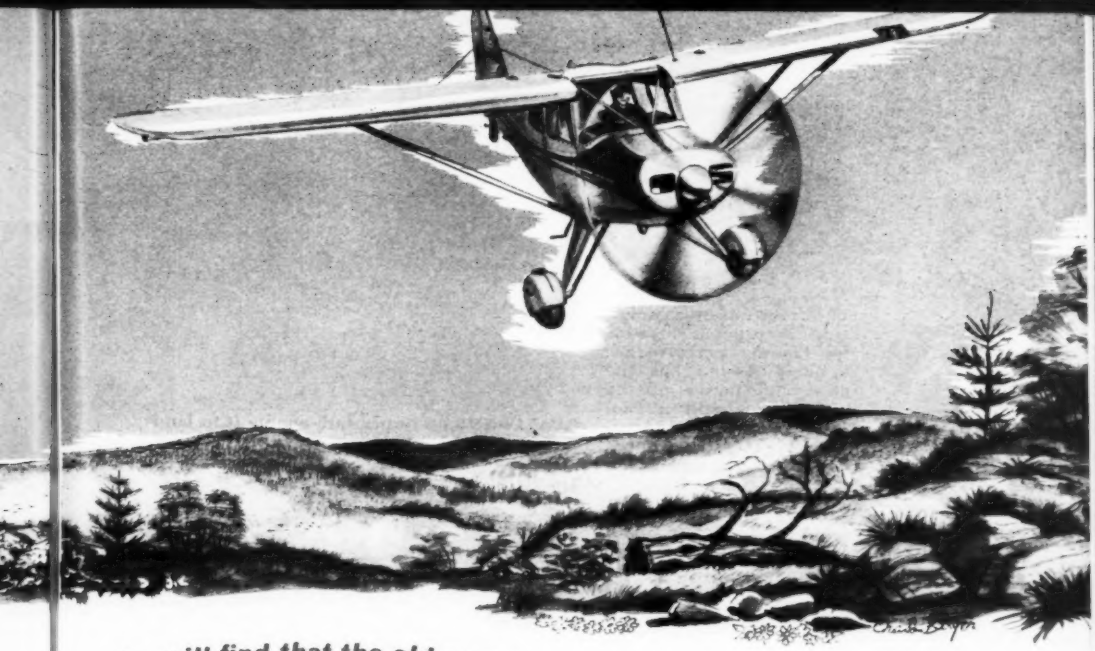
If an air-age Rip van Winkle were to wake up and step into the cockpit of a 1952 Pacer—as I did recently—he would find himself in a Piper-dream of luxury.

The cockpit is a cabin with four comfortable, upholstered, automobile-type seats. The inside is all lined with soft gray cloth. In place of the old control stick, there's a pair of side-by-side wheels. A cabin heater? Of course—two of them. And in the roof an enclosed light, and a loudspeaker so that passengers can listen in on the two-way radio. The original Cub had neither for the simple reason that it had no electrical system.

As you sit in the right front seat, you face a panel-maze of dials, knobs and switches nowadays. But your pilot nostalgically recalls the days when all he had was a tachometer, an altimeter, an oil-tempera-

EARLY-MODEL, open-cockpit Cub that introduced private lightplane flying to America. It carried two people tandem, had a 37-horsepower engine and a speed of 62 miles an hour.

PIPER TRI-PACER of 1952 has 135 horsepower and a top speed of 133 miles an hour. It has roomy, four-passenger, closed cockpit. Tricycle landing gear makes ground control easy.



he will find that the old puddle-jumper ain't what she used to be.

ture gauge and an oil-pressure gauge.

Now, there's been added an airspeed indicator, an ammeter, manifold-pressure and outside-air-temperature gauges, electric fuel-supply gauges, a mixture control. And a compass! That means navigation. In the old days you flew low in good weather, following a highway, river or railroad tracks. No need for a compass.

William T. Piper

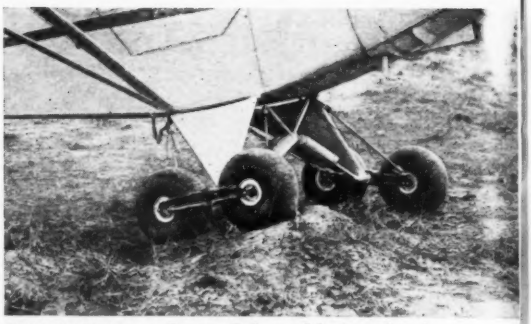
At the far left now there is a knobbed and dial-studded panel mysteriously labeled "Omnihomer." In addition to a VHF radio transmitter, two-band low-frequency receivers, and a fixed radio loop for homing on both broadcast and CAA ranges, the plane has Omnirange, an automatic electronic navigation device for homing and position fixing that makes it just about impossible to get lost.

Let's take a flight in this fancied-up lightplane. (It is still a lightplane, although its empty weight of 1,020 pounds is about double that of the original Cub, and so is its useful load of more than 900 pounds.) The pilot presses the starter button, the 135-horsepower, four-cylinder Lycoming engine fires, the prop revs up. Away we go down the runway. Airborne at 400 feet—a lot longer than the Cub of 20 years ago. But the climb, that's something else —850 feet a minute—more than twice as fast. The air-speed needle already has passed the 62-mile-an-hour mark of the old Cub. At 7,000 feet we level off. Air speed is 132 miles an hour.

You lounge against a padded armrest and survey this flying living room. Poking around you find ash trays, a glove compartment, coat hooks. The pilot adds that there are non-glare instrument lights and navigation lights for night flying. The windows are Plexiglas. Front and rear heaters, you agree, are wonderful. But fresh-air vents? There was plenty of fresh air in the open-cockpit jobs.

But what does all this cost? The Super-Custom Tri-Pacer we are flying in comes to about $6,500. Without tricycle landing gear some $200 less. And the less-fancy Standard model goes for around $5,200. But that's without extras, such as the Omnirange navi-

SUPER CUB of today has same bean-patch take-off and landing performance as old Cub—but has the speed and power of the Pacer. It is still a two-place, tandem job. Aerodynamically it hasn't changed much, and flying it wouldn't worry Rip.



DUAL WHEELS on Super Cub enable it to land and take off from rough ground. They are standard on Army version of the plane, used for liaison, reconnaissance and rescue work.

gational unit, which costs another $650.

And there's still a Cub around—the Super Cub. If you're satisfied with a 90-horsepower, two-place tandem, 110-mile-an-hour job, you can get it for $3,795. Or 135 horses at more dollars.

But dollars aren't in your mind as you turn to the pilot and shout at the top of your lungs, "How about letting me fly it?"

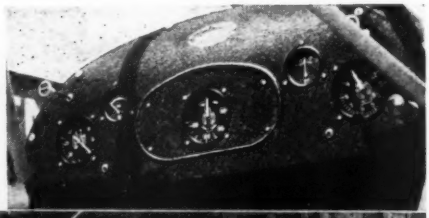
"Sure," says the pilot in an ordinary conversational voice. "But no need to shout. Soundproofing and engine muffler."

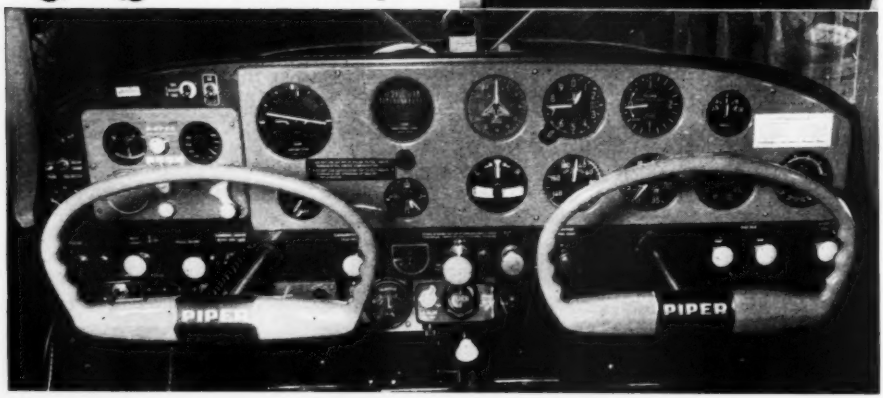
You grin sheepishly as you take over the wheel and, scorning visual landmarks, ease onto an Omni course that will put you right over Lock Haven in half an hour.

Lock Haven, Pa., on the banks of the Susquehanna, is the home of the Piper Aircraft Co. and of William T. Piper Sr., father of the lightplane and of private flying. (His Pipers are still the most popular lightplanes—last year outselling his closest competitor by almost two to one.)

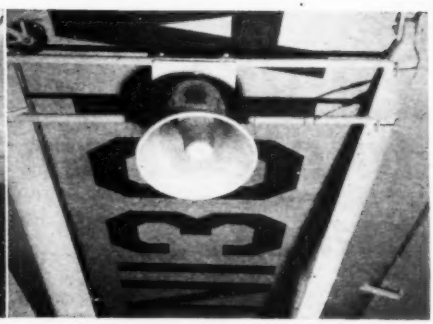
Bronzed and leathery-faced Bill Piper, now 72, was 50 years old before he entered the aviation business. That was in the late

INSTRUMENT PANEL of Piper Pacer (below) would flabbergast Rip. Even simple J3 Trainer panel (right) had more instruments than he ever knew on the early Cub. But with increased speed and power and stricter CAA regulations, the private pilot needs more instrument help.





CROP DUSTING is big job for agricultural model of Cub today. The fuselage is modified to take dust and spray tanks. For liquid spraying, nozzle boom is hung under wing.



AT ROUNDUP TIME on large ranches, this underwing loudspeaker helps coordinate the activities of cowpunchers. Another job for it is aerial direction of forest-fire fighters.

Twenties back in his home town of Bradford, Pa., where, as an investor, he bought into the Taylor Brothers Aircraft Corp., became a director, and acquired an avid interest in airplanes and a private pilot's license—both of which he still holds.

The Taylor Brothers' 100-horsepower, $4,000 Chummy came into production about the time of the depression. There wasn't a market for such an expensive plane. The company went bankrupt. To save it, Piper put in more money and some new ideas. One was for a small, low-cost airplane, out of which the first Cub was born, named after its Tiger Kitten engine.

In 1936 Piper bought out Taylor, and a year later moved the plant to larger quarters in Lock Haven. The same year the company name was changed to Piper Aircraft—and the famous Cub became the Piper Cub.

A lot of water has flowed under the Susquehanna's bridges since then. The old Cub ain't what she used to be. Bill Piper has a super-duper job that he flies today. It has an automatic pilot and automatic altitude control. It makes you a guest in your own airplane. You simply climb to any desired altitude, dial your destination and sit back and read a book.

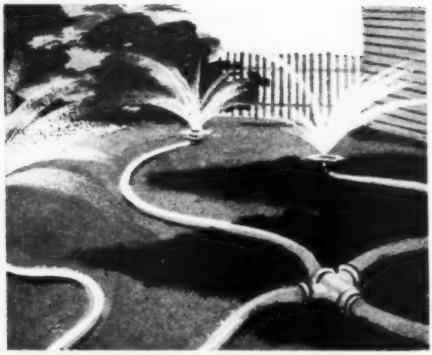
Automatic pilots are being installed in Piper Pacers on special order. You have to pay for it—$4,500 extra. But then you have the simplest means of personal cross-country transportation ever devised by man. END

HOW THE CUBS COMPARE

	MODEL E2 CUB 1931	PIPER TRI-PACER 1952
ENGINE:	37 HP.	135 HP.
WEIGHT, EMPTY:	532 LB.	1,020 LB.
USEFUL LOAD:	393 LB.	930 LB.
WING SPAN:	35 FT. 3 IN.	29 FT. 3 IN.
WING AREA:	184 SQ. FT.	147.5 SQ. FT.
WING CHORD:	5 FT. 3 IN.	5 FT. 3 IN.
LENGTH:	22 FT. 3 IN.	20 FT. 5 IN.
HEIGHT:	6 FT. 6 IN.	8 FT. 4 IN.
FUEL CAPACITY:	9 GAL.	36 GAL.
FUEL CONSUMPTION:	3 GAL. PER HOUR	7.7 GAL. PER HOUR
CRUISING SPEED:	62 M.P.H.	132 M.P.H.
RATE OF CLIMB:	400 FT. PER MIN.	850 FT. PER MIN.
CRUISING RANGE:	180 MILES	580 MILES
SERVICE CEILING:	12,000 FT.	15,500 FT.
TAKE-OFF RUN:	120 FT.	400 FT.
LANDING RUN:	95 FT.	300 FT.
LANDING SPEED:	28 M.P.H.	48 M.P.H.

I'd like to see them make . . .

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



A GARDEN-HOSE ATTACHMENT to take three extension hoses, each with its own sprinkler. This would make it possible to water the whole lawn at once.—*Mrs. C. Wool, Miami.*

BUILT-IN SLIDING WINDOW SCREENS. When not in use, screen would slide into wall beside window frame. Storm windows might be similarly installed.—*J. Peckham, Bordulac, N. D.*

DISPOSABLE BATH MATS in the form of a wall-mounted roll of heavy paper toweling, available in various colors to harmonize with tile and fixtures.—*Mrs. B. Smith, Houston.*

AN EASY-TO-DUMP WHEELBARROW. The front end could be unhooked and dropped down to empty wheelbarrow without tipping up a heavy load.—*Ronnie Marincic, Azusa, Calif.*

OVERSHOES WITH A ZIPPER UP THE BACK from heel to top, so that they would slip on and off more easily without the usual tugging.—*Daniel Bengston, Dickey, N. D.*

Metal Fingers Probe Upper Air to Check Icing Conditions

THE needle-pointed cylinders projecting from the plane at right help the Air Force measure ice formation on aircraft and provide an easy way to determine how fast the ice forms.

The cylinders revolve to get an even coating of ice, then are retracted into a refrigerated chamber. As soon as the plane lands, they're pushed out again so that measurements can be made.

The shield held by the men in the photo protects the cylinders while the plane is on the ground. The Air Force Ice Research Laboratory at Ypsilanti, Mich., devised the new testing method.

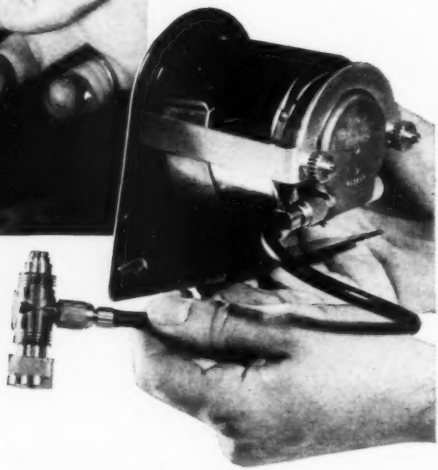
New Army Camera Shoots Fast

BIG, light and fast, the Signal Corps' new combat camera can shoot two pictures a second. It weighs only 5½ pounds, gets 50 exposures on a roll of 70-mm. film. If the photographer wants just a few shots, he slices them off with a built-in knife.

Doctors Get Hearing Aid

THIS electronic stethoscope picks up hard-to-hear chest sounds and amplifies them as much as 50 times. To isolate particular sounds, a doctor can select the tones he wants to hear loudest. Electronic Stethoscope Corp., Evanston, Ill., makes it.

TO START computing odometer, flip down lever (left). Knob on its pivot returns average-speed pointer to "zero position." Stem underneath winds clockwork. Fittings (photo below) are installed in half-hour.



New Car "Clock" Averages Speed

IF YOU drove your car at a steady 63 miles an hour for 28 minutes, 49 miles an hour for 52 minutes, and then took 33 minutes out for lunch, what do you estimate your average speed—including the stop—would be?

It's probably less than you think. A new instrument for your panel, a computing clock-odometer, will tell the average at a glance—slightly less than 38 miles per hour.

The Tachimedion will average your speed over hundreds of miles. If you want an average on driving time only, it will give that.

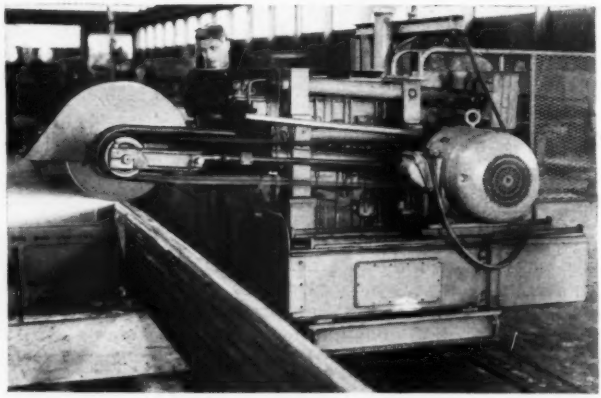
It mechanically divides distance traveled by time elapsed. A series of cams and gears comes up with the answer. The time is fed into it by an integral spring-actuated clock. It receives the distance factor from the car's odometer cable.

Standard equipment on Italian-made Alfa Romeo and Lancia cars, the instrument sells in the U. S. for about $90. It is marketed here by Imperial Motor Products, 570 Fifth Ave., NYC 19.

Mobile Grinder on Rails Puts Quick Bite on Steel Slabs

REPLACING hand-operated grinders, this hydraulically operated machine grinds steel more evenly, reduces manufacturing costs and is safer for the operator.

Mounted on tracks on the mill floor, the machine travels the length of a steel slab so that the workman can finish it off for rolling. The Mid-West Abrasive Co., Owosso, Mich., developed the new grinding tool.



American in style and size, famous French maker's new model carries six passengers easily.

Renault Shifts Engine Way Up Front

RENAULT engines move from one extreme to the other. The tiny models scooting around U. S. highways have the engine in the rear. But the latest import from Paris—an American-style car almost as big as a Studebaker—has its engine not merely ahead of the driver, but completely ahead of the front axle, nestling against the radiator grille. Even the transmission is ahead of the driver, just behind the front axle.

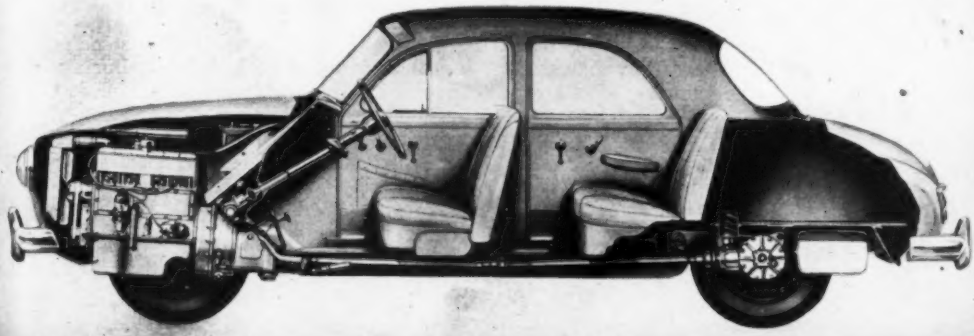
The four-cylinder, overhead-valve engine has a 122-cubic-inch displacement. With three passengers in each seat and 220 pounds of luggage, the car has reached a maximum speed of 80 miles an hour. Gas consumption averages 28 miles a gallon.

A Borg-Warner overdrive adds a fourth speed to the transmission. Seven universal joints are used, three in the drive shaft and four in the articulated rear axle that gives independent suspension to the rear wheels. Conventional knee action is found at the front.

With an over-all length of 185 inches, the car has a wheelbase of 110 inches.

Windshield and rear window are both curved glass to improve visibility. Equipment supplied with it includes flashing direction signals and a heater-ventilator-defroster unit.

The price of the new Fregate model delivered in the U. S. is $2,595. END



44,000 Storms a Day Breed Lightning

When Nature's electrical fireworks begin, strange and dangerous things happen. Here are a few rules you can follow to play safe.

By Andrew Hamilton

LIGHTNING kills 500 Americans each year and injures 1,500 more. Taking world totals, it kills more people, usually one by one, than hurricanes, earthquakes, floods and other mass disasters.

The two most dangerous areas in the United States in terms of lightning fatalities are the Rocky Mountain states, and a belt of southern states—Arkansas, Mississippi, Alabama, South Carolina and Florida. All average six or more fatalities per million of population per year, New Mexico leading with a startling 14.6. The safest areas are the New England states, New York and New Jersey, and the three states west of the Rockies.

LIGHTNING JUST MISSES an airliner. Even a direct hit would not harm people in all-metal plane.

Lightning damage costs American fire-insurance companies $5,000,000 a year. Lightning is the greatest enemy of timbermen and ranchers. Bolts start 6,000 forest fires every summer—a single electric storm in Idaho is known to have set off more than 100. And lightning kills large numbers of horses, cattle and sheep every season.

The British Air Ministry estimates that there are 16,000,000 thunderstorms a year, 44,000 a day. On the island of Java, there are thunderstorms on 223 days of every year—three days out of every five. Central Africa, southern Mexico, Panama, central Brazil and Madagascar also get lots of lightning, but none comes within 75 days of the Javanese average.

Lightning does queer things, often tragic, sometimes funny. Two men were fishing from a steel skiff in New Jersey's Barnegat Bay last summer when a sudden thunderstorm blew up. Lightning struck one man's steel rod, flashed down the zipper of his jacket and killed him instantly. The other fisherman was knocked senseless, but recovered.

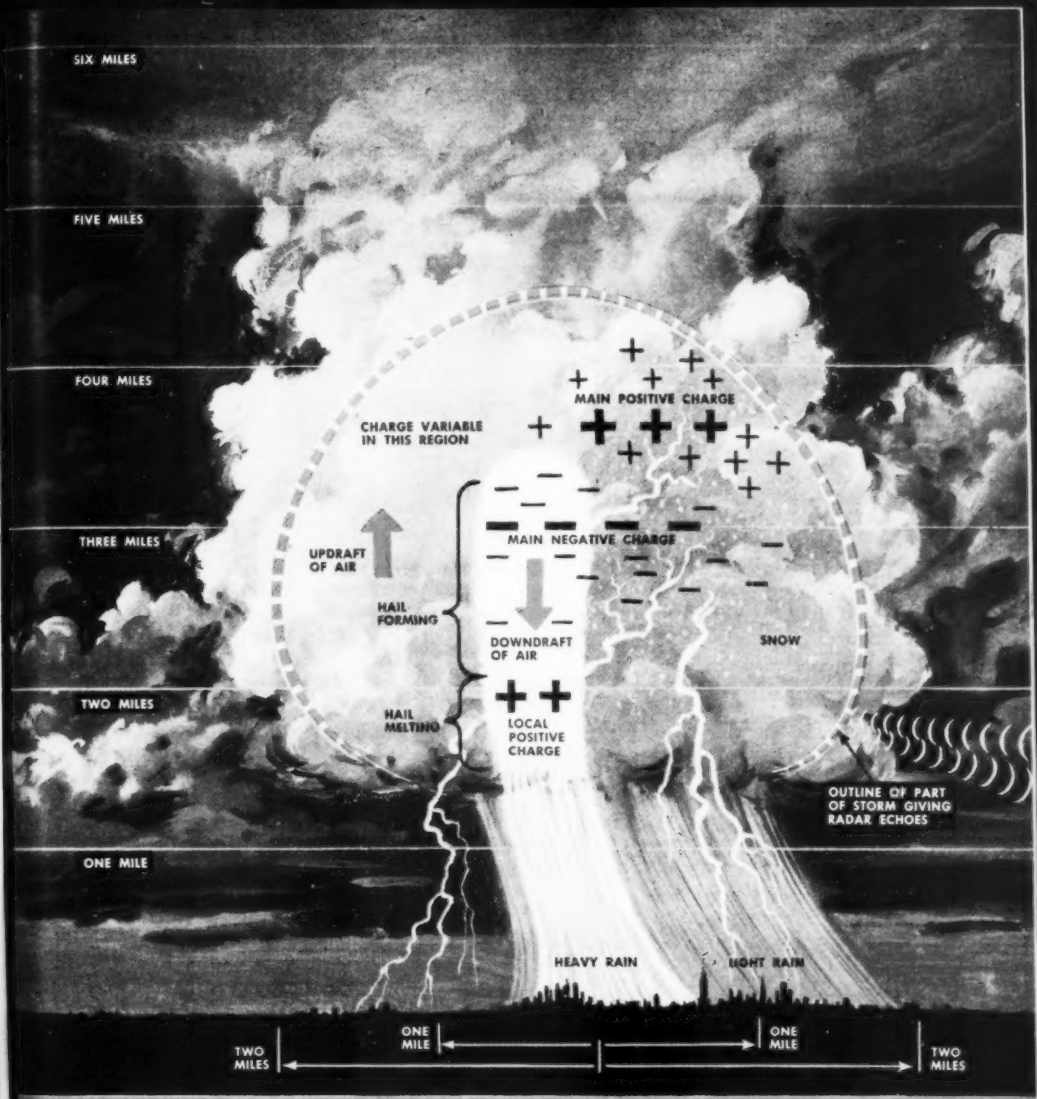
Reports from those who have been hit and lived to tell about it vary considerably. Patricia Wilson, 14, was walking to her school in Tulsa when, in a flash, her raincoat was shredded to tatters. "I felt a buzz and a couple of pains in the head," she said. "In a minute I was all right, so I went on to school."

In Cheyenne, Lloyd Frederickson was knocked down by lightning while golfing. He was unconscious a week; when he recovered, not only the day of the accident but also several before were blacked out.

Like Hot Needles

Roy Hoffman was jolted while standing in the doorway of his cottage at Buckeye Lake, Ohio. His shoes were ripped off, legs singed, trousers torn, two toes broken. "A green flame enveloped me," he said. "It felt as if thousands of red-hot needles—and I mean really hot—were sticking me."

William D. Wylie, on the other hand, was



This Is How a Thundercloud Makes Lightning

A THUNDERSTORM consists of one or more "cells," or clouds, each a mighty natural generator of static electricity, like the one shown in action here. Lightning, sometimes wholly within cloud and sometimes striking earth, results from built-up charges. It flashes between centers of opposite charge in cloud, or between a charge center in cloud and one of opposite sign induced at surface of earth.

Positive charge of typical thundercloud is mainly in upper part; negative charge, below. How they get there is controversial. One theory: falling hail and upward-borne water droplets collide, acquire negative and positive charges respectively, and carry these to different parts of cloud. Significant observed fact: no electrical phenomena occur until about 10 minutes after radar echoes show precipitation has begun.

CHIMNEY TOPPLED by lightning fell through roof of Philadelphia hospital, injuring four.

FIREMEN FIGHT BLAZE after lightning ignited big gasoline-storage tank at Wood River, Ill.

nonchalant. He was working in a forest near Spokane when companions were horrified to see lightning strike the head of his upraised axe.

Wylie shook his arm, said it tingled. They told him what had happened.

"Must've been darn poor lightning," he muttered, and went on chopping.

These dreaded bolts come up with some queer twists. Joseph Nicol's potato patch in Springwater, N. Y., was struck, and the spuds were roasted "soft enough to mash." In Alexandria, Va., a railroad stop-and-go signal was reversed—with the result that a Chesapeake and Ohio train collided with Seaboard's Silver Meteor.

FREAK LIGHTNING BOLT killed three baseball players, injured other players and spectators and, seeking path to ground, dug this deep furrow in grass of Baker, Fla., ball park.

Down through the ages lightning has made man's hair stand on end, his eyes bug out in terror. But it was not until 200 years ago that any scientific study was attempted. Then a shrewd and inquisitive Philadelphia printer, Benjamin Franklin, flew a silk kite into a summer thunderstorm. To the lower end of the cord was tied a piece of silk string holding a metal key. Franklin repeatedly touched his bare knuckle to the key; each time he saw a strong spark and felt a shock, thus proving the heavenly brilliance to be electricity.

Ben Was Lucky

Why he wasn't killed or at least knocked senseless has been a marvel to scientists ever since. For once, the proverbial luck of fools was granted to a sage.

Men have cautiously tinkered with lightning and thunderclouds ever since, but it is only within the past 15 years that we have learned much more than the Philadelphian knew. Scientists now say the earth is like a giant condenser from which current continually leaks into the atmosphere; thunder-

SPECTACULAR DISPLAY of Rocky Mountain lightning was caught by camera during electrical storm at Denver. Brief exposure recorded several flashes in rapid succession.

storms are Nature's batteries for keeping the condenser recharged.

It's Useful

Lightning has its place in the earth's scheme of things; each stroke releases from the air large quantities of nitrogen, in the form of nitric acid, which is essential to the soil for plant production. Dr. B. F. J. Schonland of South Africa—one of the world's foremost lightning authorities—estimates the annual production of nitric acid by lightning at 100,000,000 tons, which far exceeds the output of man-made fertilizer from all the world's manufacturing plants.

Dr. Horace R. Byers, professor of meteorology at the University of Chicago and director of the Government's thunderstorm project in New Mexico in 1946 and 1947, says those cauliflower-shaped thunderclouds that tower in the summer skies are produced chiefly by swift-rising air currents. "Rising warm air mixes with cold downdrafts," he points out, "creating a terrific turbulence. A thundercloud is like a Mixmaster gone berserk. Winds churn and boil at speeds up to 100 miles an hour, carrying with them

[*Continued on page 232*]

How Not to Be Struck by Lightning

WHEN A THUNDERSTORM THREATENS, cancel that golf date, leave your bicycle in the garage and your tractor in the barn, and eat your picnic lunch at home.

IF CAUGHT OUTDOORS, hurry to a sizable building for shelter. If none is near, lie flat on the ground until the storm passes.

AVOID ISOLATED TREES, water towers and exposed ridges and peaks.

KEEP AWAY from metal fences, wires of all kinds, and metal pipes.

IF YOU'RE SWIMMING, get out of the water quickly; if boating, head for shore. Being in or on the water is dangerous.

IN A HOUSE, stay clear of stoves, fireplaces, attics, doors and windows. Keep out of a bathtub or shower during a storm.

IF IN A CAR, BUS OR TRAIN, stay there—you're relatively safe. If you *must* get out, avoid touching car and ground at once.

IF SOMEONE IS STRUCK, give him artificial respiration—probably the bolt paralyzed his diaphragm or lung muscles. Burns can be treated after he is breathing again.

Draggin' Wagons Hit 100

The cars that compete in drag races are matched up in pairs according to engine and body

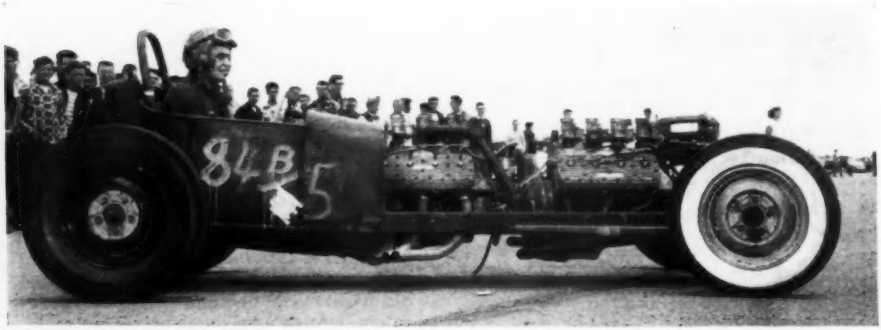
Now the hot-rodders have latched onto a brand-new sport —who can pack the most pickup into exactly 1,320 feet?

IF A short-coupled old jalopy reminiscent of Jack Benny's Maxwell pulls up beside you at a red light and the driver bets he can beat you away—don't take him up. He may be a dragster.

If so, he could be holding the reins on as many as 400 horses hidden under the homely hood of his drag wagon. This new kind of hot rod is built for just one purpose: a pickup fast enough to make the proverbial scared rabbit look listless.

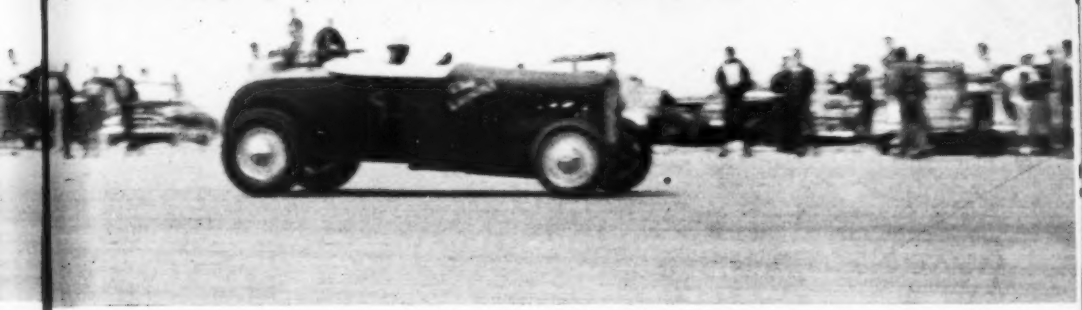
You're not likely to run into a dragster on the highway. But on abandoned air strips in California, the rapidly spreading sport of drag racing is going full throttle. Improbable contraptions—some with no radiator or starter and only one gear—are toeing the mark two by two and "draggin' it out" to see which one can get up to the highest speed in exactly 1,320 feet—one-quarter of a mile. Only the last tenth of that distance counts. Going through the 132-foot timing trap the cars are clocked electrically to 1/1,000-second accuracy.

Divided into seven different classes, drag wagons look like everything from a beat-up jalopy to the streamliner on the opposite page. In their efforts to get the most speed in the least distance, they have hit as high as 122 miles per hour.



MOST POWERFUL DRAG RACER yet is this twin-engine job on a lengthened Ford frame. Two Mercury engines coupled in tandem develop 400 hp., drive 1,730-pound car 117 m.p.h.

in Quarter-Mile Races



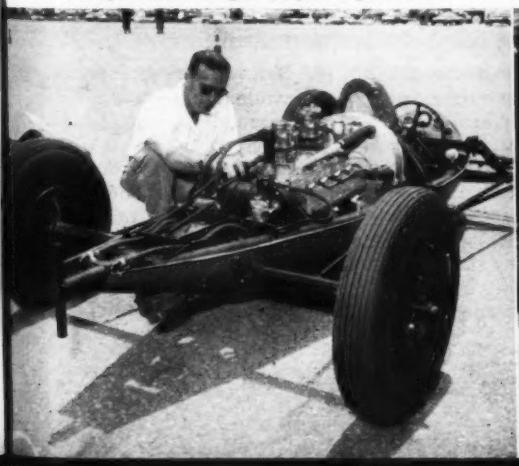
type. The loser of each two-car dash is eliminated until a winner in that class is declared.

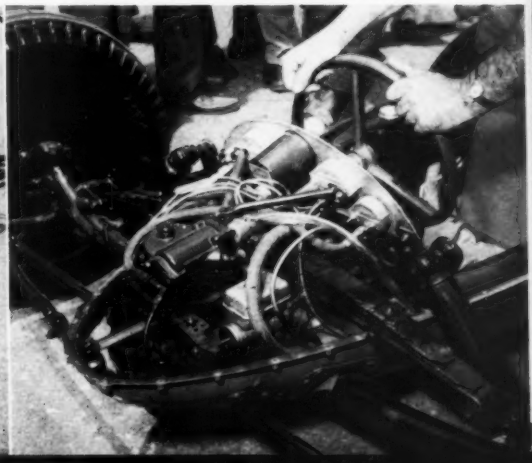
CRAMMED INTO THE COCKPIT of this tiny Jerauld Special (also pictured at right and in photos below) driver's knees almost hit his chin. Car is powered by 80-horsepower V-8.

RACING TIRES are used in front, motorcycle tires in rear. Chrome-moly tubing and steel frame give car plenty of strength. The little drag wagon's wheelbase is 82 inches.

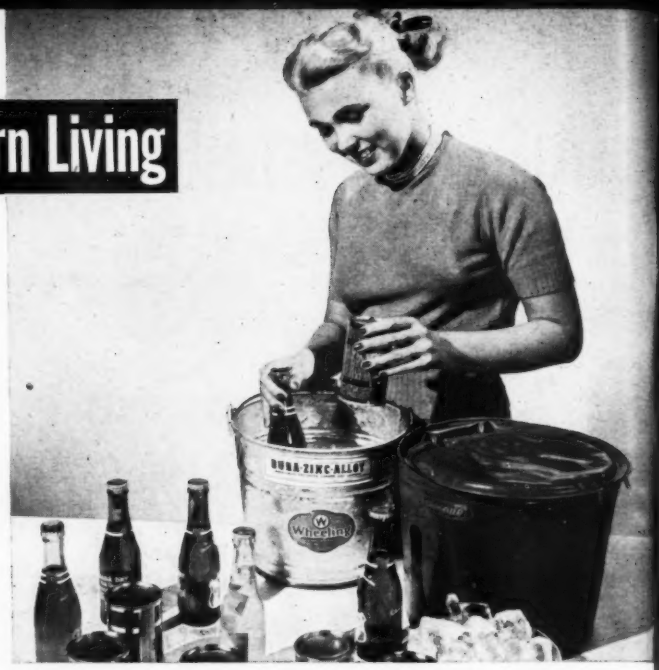
ENGINE IS AT REAR, as in most cars built especially for drag racing. This puts more weight on rear tires, needed for traction in fast getaway. Racer weighs only 990 pounds.

THROTTLE IS CONTROLLED through master hydraulic cylinder at center of front-end assembly connected to slave cylinder. Car races in Class O—for engines under 90 cubic inches.





Aids to Modern Living



1. Picnic Pail. Hot or cold foods and beverages that are packed in this carrier keep their temperature as long as 15 hours. The galvanized pail holds 150 ice cubes or a dozen bottles, cans or cartons. The plastic jacket is insulated with glass fibers, and two separate zippers, running half way around each side of the cover, seal out sand and dirt yet leave the handle free for carrying.

The Pailmaster is also handy for keeping frozen-food packages cold during extended shopping tours.

4. Latch Lock. Replacing the regular knob with this Knob-Lok—a screwdriver job—converts an ordinary door latch into a cylinder type that locks securely. When the key is turned and removed, the knob spins freely, so that the latch can't be sprung. Operation of the inside knob is not affected.

5. Ladder Platform. Standing on a round-rung ladder for hours while you wield paintbrush or hammer can be hard on the feet. This aluminum Res-Tep makes the job easier, lessens the danger of slipping off. It hooks over the rung of any standard ladder and can be quickly changed from rung to rung.

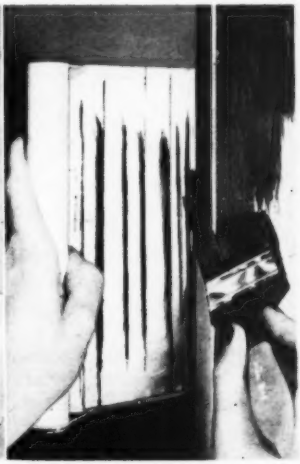
6. Drip-Catching Pitcher. The wide trough running half way around this jug, just below the spout, catches drips and drains them back through openings at either end. Designed for pouring waffle batter, it holds 1½ quarts. There's a pint-size little brother, sans lid, for serving maple syrup or honey.

2. Patty Press. This wooden mold will shape up a big batch of hamburgers for a picnic crowd, or for freezer storage, in no time flat. And it eliminates the extra handling that toughens meat. When the burgers are stacked, use the hardwood surface of the board for slicing onions and pickles.

3. Mending Tape. Slits and jagged rents in plastic raincoats, tablecloths and shower curtains can be neatly repaired with Plasti-Mend. A thin cloth is laid over tape and tear and the tape is pressed into place with the iron on low heat. Plastic material can also be seamed with the tape.

7. Doughnut Machine. Fill this plastic container with doughnut batter and each time the plunger is pressed, a perfect doughnut drops into the pan. It holds batter for two dozen doughnuts.

8. Take-Down Shower. Suction cups on an adjustable frame fit this shower to any size tub. A no-splash spray head can be raised or lowered on an upright rod; the whole thing folds up for storage.

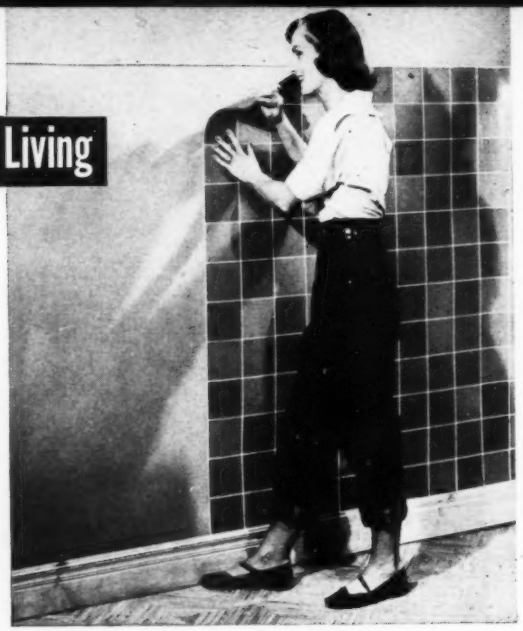


9. Paint Mask. This metal sheet with a wax-paper covering protects the wall while you paint woodwork. Turning the tube rolls up smeared paper, brings out clean surface from a holder.

Further information on these products can be obtained from: 1. Plastic Sheet Fabrication, Inc., 855 Sixth Ave., NYC; 2. Quality Products, Box 1186, Gering, Neb.; 3. John Dritz & Sons, 1115 Broadway, NYC; 4. Mastercraft Products, 212 Summer St., Boston 10; 5. Res-Tep Inc., 1340 E. 222 St., Euclid 17, Ohio; 6. The Village Store of Lake Placid, N.Y.; 7. Popeil Bros., 14 N. Sangamon St., Chicago 7; 8. Madco Treasure Chest, 532 Pine Ave., Long Beach, Calif.; 9. Bertram Engineering & Supply Co., 3125 Harrison St., Kansas City, Mo.

Please turn the page for more aids to modern living.

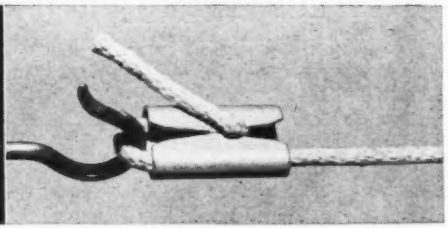
MORE Aids to Modern Living



10. Pliable Tile. This washable, enamel-finished wall covering, patterned to resemble tile, has a backing that is thin enough to be cut with a linoleum knife or with sturdy scissors, and flexible enough to work around curves and corners. Felt impregnated with neoprene forms the backing.

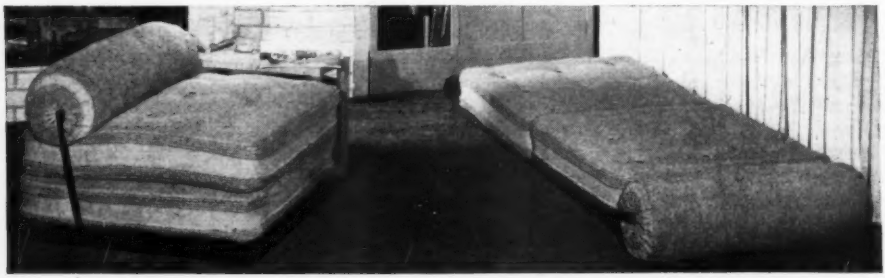
Trenwall, which comes in six colors, can be used over plaster, hardwood, plywood or gypsum boards, and is applied like linoleum. Linoleum paste is spread on the wall and the material is set in place and smoothed down.

11. Plastic Washers. That dripping faucet can now be fixed with a plastic washer that is said to last longer than the rubber or fiber variety. The maker claims it is odorless, tasteless, and unaffected by acids, alkalis and caustics.



12. Rope Tie. With this clamp no knots are needed to put up a clothesline, moor a boat or secure freight on trucks. Pass the rope through the tie, pull taut and lock in the slot. To release the rope, just remove it from the slot.

13. Chair Bed. Two cushions sewed together and supported by a wooden base form this lounge chair. When a platform is pulled from the base and the upper cushion is laid over it, Jumbo Sleeper becomes a bed. The rolled back rest adds length to the bed.



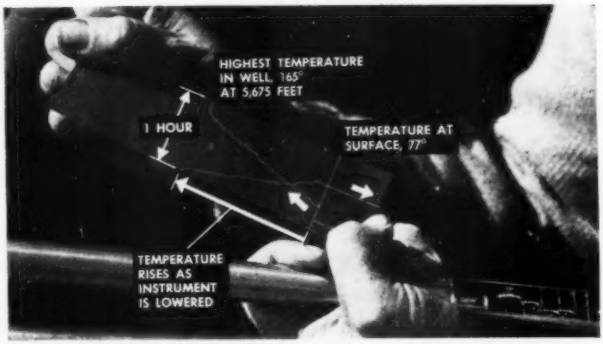
Further information on these products can be obtained from: 10. Sloane-Blabon Corp., 295 Fifth Ave., NYC; 11. Los Angeles Molded Products Co., 11129 Chandler Blvd., North Hollywood, Calif.; 12. General Tool & Machine Co., 1226 E. Michigan Ave., Kalamazoo, Mich.; 13. Brown-Saltman, 2570 Tweedy Blvd., Southgate, Calif.

DOWN A WELL goes thermometer on wire.

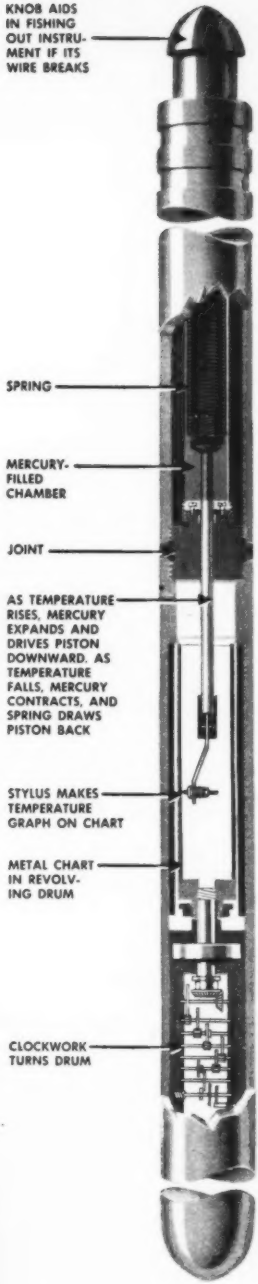
How They Take an Oil Well's Temperature

AS AN oil well goes down, its temperature goes up. To chart the rise, experts of Humble Oil & Refining Co. of Houston lower this javelin-shaped recording thermometer. It locates casing leaks, where temperature abruptly changes; finds the level of cement poured around a casing, which emits heat in setting; and predicts the composition of the oil, which varies with the temperature.

JAVELIN-SHAPED tube of stainless steel, about six feet long, contains thermometer. Metal recording chart is rolled up and inserted, as above, in drum turned by clockwork. Then reassembled instrument is ready to take an oil well's temperature.



GRAPH ON METAL CHART shows well's temperature from surface to bottom. During the recording, stylus went off one side of rolled-up chart and re-entered on opposite side. Rise in temperature with depth is normal; deviations interest the oilmen.



SIMPLIFIED DIAGRAM, NOT TO SCALE, SHOWS HOW THERMOMETER WORKS. ITS ACTUAL SIZE, OVER ALL: 6¼ FT. LONG, 1 5/16 IN. IN DIAMETER

KEEP YOUR ELBOWS IN CLOSE, cautions the instructor. Pilot had better remember this advice before trying to blow himself clear of the cockpit of an actual jet fighter—with its maze of protruding levers, switches and knobs—at a speed of several hundred miles per hour.

RED LIGHTS ON CONTROL BOARD blink out one after another as student performs each step of procedure necessary before "bail-out." When all the lights are off, instructor releases master control switch in his right hand, arming the shell's trigger circuit.

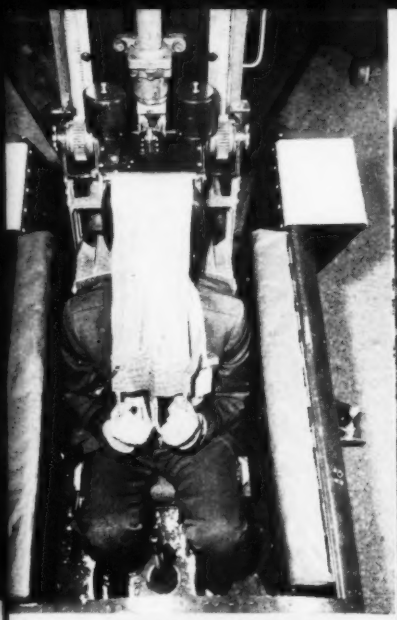
Fire Drill for Jet Pilots

RECENTLY adopted by the Navy to familiarize its jet jockeys with the technique of emergency bail-out, this ejection-seat trainer literally shoots the pilot out of his dummy ship. A 37-mm. blank cartridge delivers a kick that boosts him into the air with a force of nine G, for a dizzy ride up, and down, the rails of the 25-foot tower.

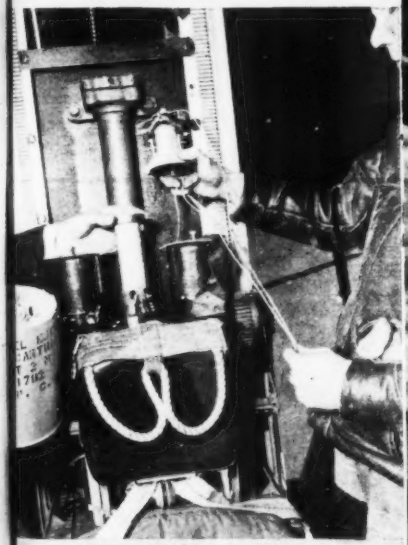
A refinement of an earlier experimental model using a clumsy 105-foot mast (PSM, Jan. '50, p. 126), the compact new trainer weighs only two tons, is readily transportable and can be set up in half an hour. The simulated cockpit contains all the equipment necessary for practicing ejection procedure: throttle, canopy lever, stirrups, ball handle for oxygen bottle, and face curtain. Electrical switches attached to the controls operate red lights on an indicator panel on the nose of the mock-up F9F Panther jet. The instructor stands facing this panel, his hand on the master remote-control switch.

"One!" The student in the ejection seat cuts the throttle. "Two!" He pulls the pre-ejection lever, simulating release of the cockpit canopy and taking the shell off safety. "Three!" He takes his feet off the rudder bars and puts them on the stirrups. "Four!" He yanks the oxygen control ball. If all the tell-tale lights are now extinguished, indicating that the preliminary steps have been properly performed, the instructor lets up on his control switch and yells "Pull!" The student jerks the canvas face curtain down, firing the 37-mm. blank, and up he goes like the man who gets shot out of a cannon at the circus.

Seconds later, cushioned by two hydraulic-pneumatic buffers and faithfully observing the law of gravity, he is right back where he started from.



NO MULE EVER KICKED LIKE THIS. When canvas mask is pulled down (above), shell detonates automatically. Canvas also keeps pilot's head from snapping back, protects his face from blast of air.



LOADING THE "GUN" under the ejection seat with 37-mm. blank cartridge. Canister at left holds three charges. Rope handles are attached to the face curtain just behind the pilot's headrest.

PILOT STREAKS SKYWARD at an acceleration of nine G, but since the jolt lasts only a fraction of a second it's not too tough to take. In the picture above, 10 feet up from start, gravity is already slowing the ascent.

P.S.

Last minute news & notes...

A "THROWAWAY" GASOLINE ENGINE can be mass-produced so economically that replacing it will usually be cheaper than overhauling it, according to the Plan-O-Mill Corp. of Hazel Park, Mich. It is making a simplified two-cycle one-lunger that turns out 1¼ horsepower, and weighs only seven to 10 pounds, depending on materials. It is coupled directly--no crankshaft--to the machinery it powers.

WAITING AIRCRAFT are connected by hose to a central air-conditioning system at the new Greater Pittsburgh Airport, the first so equipped. The Westinghouse-built installation keeps passengers comfortable as they sit in a plane awaiting a take-off, no matter how cold or hot the weather is outside.

A STORAGE BATTERY to which the acid is added when you buy it assures you of getting a fresh one. Until then, the dealer keeps the acid separate in a plastic bottle. Introduced by Firestone, the Dri-Charged battery has been placed on sale in northern Ohio. Later it will be available elsewhere.

RUBBER MIXED WITH ASPHALT is being tested as a surface for a tennis court in Java. It is said to give the bounce of grass--minus the upkeep. Rubberized asphalt has been tried in the U.S. for paving streets and playgrounds.

BREAKDOWN-PROOF TV may be just around the corner. You'll soon be able to replace the small tubes--which cause 90 percent of set failures--with rugged new types designed to outlast the set. Highly reliable tubes have been developed for aircraft and military equipment. The new TV types, made to the same standards, are now to be mass-produced by GE for civilians.

CONCRETE WINGS for aircraft are no fantasy. A leading French plane maker, Breguet, reports an experimental wing design of strong prestressed concrete for supersonic planes with high wing loading.

OLYMPIC EVENTS will be clocked to 1/100 second this summer at Helsinki. Omega's automatic Racend Timer--used in at least four events--takes continuous pictures of the finish line, recording on film each man's exact time as he crosses. Camera and timer are started electrically by the starter's gun. Equally fast semi-automatic and manual timers are also in use. The best stop watch can slice time only into tenths of a second.

RADIOACTIVE IODINE is running an elevator in latest application of atomic by-products. The isotope starts an automatic elevator and stops it within 5/1,000 of an inch of the floor level--50 times as close as the best previous controls. The device is installed in a San Francisco hospital.

RADAR to keep jet airliners from bumping into mountains or turbulent thunderclouds is being tested by the British. Similar to the search radar used in military interceptors, it may go in the new Comets.

"FLYING SAUCERS" are aloft again this summer--the balloon kind that some experts think started the reports. Launched in Minnesota to study the stratosphere, the balloons look like 100-foot spheres at high altitudes. At sea level, they're 160 feet long, 40 feet in diameter. Their warning flashing device can be seen 10 miles away.

BUILDING A BOAT in your home shop and then finding you can't get it out is a stock gag for cartoonists. Raymond Stone of Quincy, Mass., did it, but he had the last laugh. He knocked out a wall section, hauled his boat out--and then put in a picture window. Planned it that way, he says.

The Editors

MECHANICS
and
HANDICRAFT
REG. U. S. PAT. OFF.

Are Natural Finishes Practical?

By Darrell Huff

Yes—if you take the trouble to put them on carefully and keep them looking right.

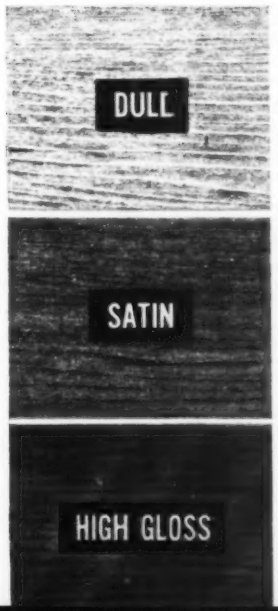
THERE'S no doubt about it. The handsomest new homes, the ones that win the architects' prizes, almost always have unpainted, "natural-finish" exteriors. They may be any color of the rainbow, but the warm, native beauty of the wood grain shows through.

Manufacturers are meeting this trend with many new finishes that protect siding, trim and panels without concealing the grain. You may want to try them, too.

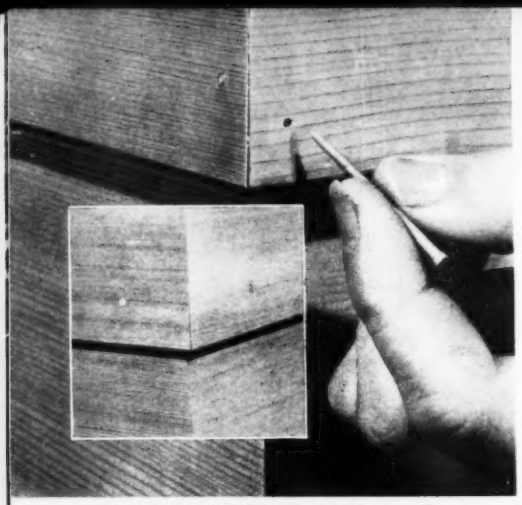
First, though, you'll probably want to take a long, hard look at two big questions:

Is a natural finish any good? Will it last?

Getting answers to these has cost manufacturers, govern-



CLEAR FINISH gives one of three effects, depending on whether a dull sealer, a semigloss oil or a glossy varnish is used.



CORROSION-RESISTANT NAILS are important when a clear finish is used. Aluminum or hot-dipped galvanized nails are both good. They may be left exposed (inset) or countersunk and puttied over to conceal them. Use putty that matches the color of the wood.

ment agencies and lumber associations a good deal of time and money. The low-down, it appears, is this:

- The best natural finish will not stand up nearly as well as paint.
- And while it will be cheaper and easier to put on at first, it will probably cost more than paint in the long run because of the greater labor and more frequent care it requires.
- If you do the work yourself, however, the cost difference between paints and natural finishes will not be so great.

Natural finishes come in three main varieties—clear, bleach and stain. Which you'll use depends on the kind of wood you are working with, its condition and what you want it to look like.

As a rule, a clear finish will darken the wood a bit—just as water does to fresh-cut wood. A bleach, on the other hand, will lighten the tone. A stain, as its name suggests, changes the wood to a desired tone without hiding the grain.

Preparation. If the wood is already in place, there may not be much you can do to it. The cleaner and smoother it is, the better the result.

If you use ordinary nails—particularly with redwood—they should be set and the holes filled with matching putty. Puttying should usually be done in advance with a stain finish. But with a clear finish, put on the first coat before puttying.

Any finish will stand up better on back-primed lumber. Give the backs and edges of the wood a coat of the finish and then nail it up as soon as the finish is dry. Be careful that the finish does not run onto the faces of the boards and streak them.

Clear finishes are oils, sealers and varnishes. They vary from water-clear to dark amber, but are all transparent and contain no suspended pigments.

Since they have little hiding power, they're useful only if your wood is of a good grade and practically in mill condition. If the wood is weathered or dirty and you are not prepared to sand it clean, a finish with enough color in it to hide the deficiencies is preferable.

The simplest, oldest and probably cheapest of the clear finishes is linseed oil. At $2.50 to $3 a gallon, it costs a third to two-thirds as much as varnish. However, it darkens redwood excessively. On any wood it is not a good moisture sealer and dries so slowly that it may pick up dust. It may also run, wrinkle or mildew.

So use linseed oil only if price is the major consideration. In very warm, dry weather, use the raw type of linseed. Otherwise, use boiled oil (or raw oil with about 2⅔ oz. of liquid paint drier added to each gallon). To avoid excess oil on the surface, add one to two quarts of thinner (turpentine or mineral spirits) to each gallon of oil.

Brush, spray or mop it on. Use two coats on new wood. If the second coat shows glossy spots after 30 minutes, remove them by wiping with a cloth. Burn the rags promptly. They can start a fire.

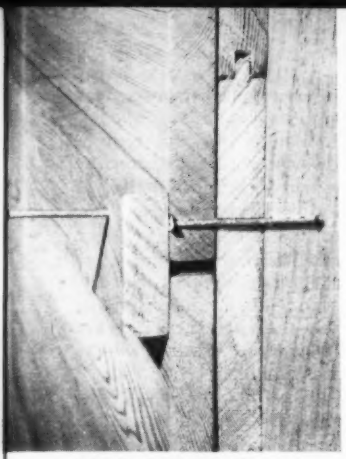
Other oils. For a finish free from some of the drawbacks of linseed, you can use one

Pigmented Oil Finish You Can Make

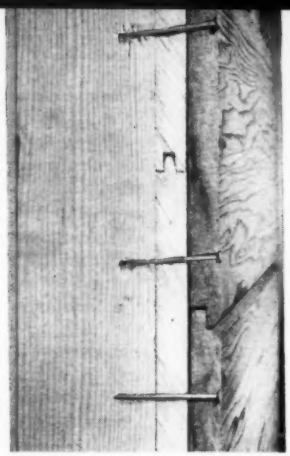
You can get almost any tint you want in a linseed-oil finish. Simply add a small amount of paint or color-in-oil.

If you use paint to tint the oil, add a little at a time, testing as you go, until you get the effect you're after. White, cream or pale gray paint is most often used.

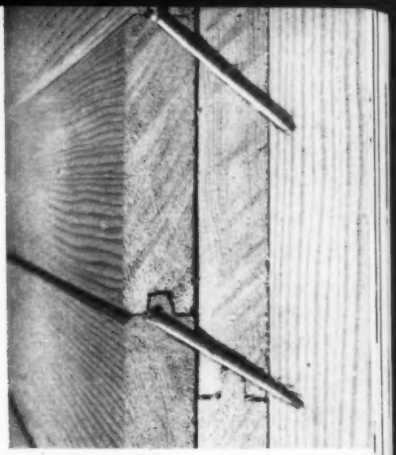
The colors-in-oil are sold at paint stores. There are many shades, but the most frequently used is burnt sienna. Mix by stirring it with just a little of the linseed oil first, then adding to the rest of the oil. A proportion commonly used is about one-half pint of sienna-in-oil to each gallon of linseed oil.



BOARD-AND-BATTEN construction is nailed like this. If lumber is green, nail battens on one side only until boards have shrunk.



SHIPLAP SIDING should be nailed up so that joints in siding do not fall over joints in sheathing. This makes for tighter construction.



BLIND NAILING is used on tongue-and-groove siding. Each board is nailed diagonally through tongue before board above it is put in place.

of the oils variously known as log oil, log cabin oil, logwood oil, and the like. Use them like linseed, but do not thin them unless the label says to.

One oil-base finish is Liquid Raw-Hide[1]. It is especially good for redwood and cedar, but may be used on any wood. You simply brush on three coats for a clear gloss. If you don't want gloss, use the dull-finish type for the third coat.

Some manufacturers may quarrel with me on this, but it seems to be a pretty general rule that the higher the gloss the longer the finish will stand up. There's one compensation, though. A dull finish in need of renewing rarely looks as dilapidated as a glossy one that has begun to weather away in spots.

Varnish is the other clear finish most commonly used. It should be spar varnish, preferably the marine type. Brush on at least three coats, thinning the first coat slightly with paint thinner (a pint to a quart per gallon). Do not use shellac under it—even on knots in pine.

Varnish is not an ideal finish for large exterior areas. It may craze or crack or develop milky patches, and over the years such a heavy coating will be built up that it may have to be laboriously removed for a fresh start. The gloss of varnish is often not wanted on exterior walls, but it may not be objectionable on trim, doors or window casings.

Bleaches. Bleaching oil or bleaching stain gives wood the appearance of having weathered naturally. This finish permits uniform weathering and also protects the wood, making it less likely to crack, check, cup or otherwise misbehave. Such finishes work well with dark-colored woods.

By mixing bleaching oil with silver-gray stain (or buying the combination ready-mixed), you can get a pleasant bleached effect. Since this mixture is about the color of weathered wood, the building looks at once pretty much the way it will continue to look. Without this pigment, the appearance may be fairly unlovely during the first few months of bleaching.

Stains, or colored sealers that give the appearance of stains, all contain pigments. They counteract weathering and ordinarily add little or no gloss to the wood.

One of these products is Rez[2]. In redwood color it gives redwood a lasting dark

1. Linseed Oil Products Co., 359 Del Monte St., Pasadena, Calif.

2. Monsanto Chemical Co., 911 Western Ave., Seattle 4, Wash.

OIL FINISHES are inexpensive, go on quickly and smoothly. This one contains wood preservative so mildewing of wood is unlikely.

SIDING that soaks up a new coat as thirstily as this is overdue for refinishing. One coat is usually enough, but this needed two.

shade not greatly different from many clear finishes and will also give lighter woods a redwood appearance. It is made also in a darker shade, mahogany, and a lighter one, cedar. The other shades, sage and driftwood, give a soft green and a soft gray cast, respectively, to the wood.

Rez sealers are all applied in the same manner. Brush on one heavy coat. Let dry overnight. Brush on a second coat somewhat less heavily.

For a lighter redwood color, you can use Sequoia Red[3] stain. It is used on any redwood siding, but seems to be particularly good for rough materials where most finishes would be hard to apply.

Sequoia Red is one of a group of heavy-bodied stains. Although fairly heavily pigmented, they let some grain show. They are made in shades of soft grays, buffs, red, yellow and green. A two-coat job is called for.

Coverage figures of pigmented finishes are worth noting. A gallon will put two coats on 200 to 250 square feet of smooth siding, but will cover only 100 square feet of shingles or rough or resawn siding.

Pigmented finishes are especially desirable for inferior lumber or stained, weathered or dirty stock since they cover many things and are not likely to need renewing as soon as the clear ones.

Combination finishes have been worked out by some manufacturers who are convinced that for certain purposes no single finish will serve as well. In these systems you begin with a pigmented finish and end with a clear one to protect it.

One system, called Durable Woods Finish[4], is fine if you have choice lumber that has been sanded smooth and clean.

Follow the sanding with a coat of Breicraft stain. It comes in knotty pine, redwood and other colors. Apply the stain liberally with brush or rag, wait about 15 minutes, then wipe it clean with cheesecloth. Let it dry overnight. Then brush on a coat of Durable Woods Exterior Gloss[4], adding turpentine to make it brush more easily. When this is dry, sand lightly and apply another coat.

For a good gloss, a third coat of the same finish is recommended. If time or budget interferes, this can wait a year or so. If you don't want the gloss, you can use Exterior Dull for the final coat.

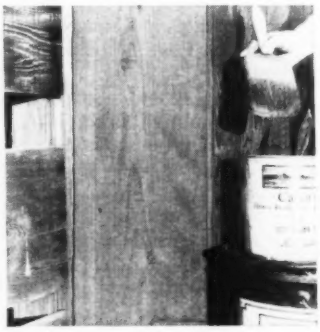
Another system is based on the Liquid Raw-Hide clear finish previously mentioned. It can be used with cedar or redwood, or to give a redwood appearance to fir or pine. You'll find it desirable for redwood that has discolored.

The first coat is Redwood Color, a combination of stain and sealer. Follow it one or two days later with a coat of Liquid Raw-Hide Clear. The third coat can be the same clear finish or the dull.

3. Samuel Cabot, Inc., 141 Milk St., Boston 9, Mass.

4. Breining Bros., First and Harrison Sts., Hoboken, N. J.

ROUGH, WEATHERED BOARDS are difficult to finish. A simple, low-cost solution is this heavy-bodied shingle stain. It looks like heavy orange paint as it goes on but in a few minutes sinks in to reveal the grain and darkens to a handsome redwood color.



Preservatives. One drawback of most oil or varnish finishes is that they may mildew, producing a dark discoloration. Unless you are using an oil that already has a preservative in it, it is best to mix one with the oil. This is particularly important where the wood may stay damp for long periods and where it has not been back-primed.

Buy a concentrated solution of pentachlorophenol, sold by lumber dealers, and mix one gallon of the preservative to three gallons of oil. Don't use any turpentine or paint thinner. If you want, you can also treat the wood first with a preservative, but this is more work than mixing it with the oil.

Sealers do not mildew as easily as oils. If conditions are quite damp, use a preservative before or mixed with the sealer.

Varnishes require preservatives for about the same conditions as sealers do. But don't add the preservative to the varnish; it will thin it too much. Treat the wood with the preservative first.

Maintenance of most natural finishes only means adding another coat of the same finish when needed. Areas that sun and rain strike for many hours at a time will need treatment soonest. They may need it annually.

You can often refinish only one wall to match it with the rest of the building. A high-gloss finish, such as varnish, may not match, though, and the whole building may require treatment.

Painting. If you want to change from a natural to a painted finish, you may have to do some work. If the finish is an oil or sealer that sinks into the wood, you can paint over it later, but only if it has weathered at least a year and if you have sandpapered off any gloss.

KNOTTY PINE shouldn't be hidden under paint. Instead, put on a clear finish quickly before the wood loses its color to the weather.

The job will be harder if you have used varnish or so many coats of sealer that they have built up a coating. The only thing to do then is to remove it with varnish remover, followed by sanding, before you go ahead to prime and paint.

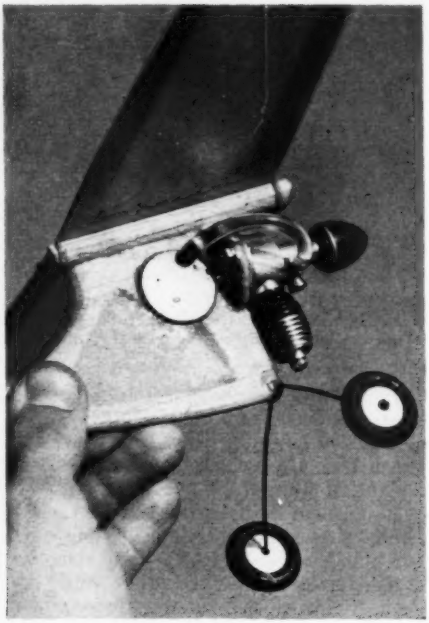
Because of the time and labor that a natural finish takes and the possible difficulty of changing it later, it's a good idea to be pretty sure of what you want before you begin. But if your mind's made up and your hands are willing, your eyes will be well rewarded by the result. END

NATURAL FINISHES

	FIRST COAT	SECOND COAT	THIRD COAT
Clear-grade siding in clean, sanded condition	stain—pine or redwood	gloss exterior wood finish	same—gloss or dull
Durable natural finish for doors, windows, trim, of painted house	marine spar varnish plus 1 pt. thinner to gal.	marine spar varnish, not thinned	marine spar varnish, not thinned
Medium-grade siding in fair-to-good condition	2 coats of gloss oil or sealer finish made for pine, redwood		same—gloss or dull
Rough boards and battens that are badly weathered	2 coats of heavy-bodied stain		none
Inexpensive finish for cabin or other siding in fair condition	2 coats of boiled linseed oil colored with burnt sienna; ½ gal. thinner to gal. of oil		none

FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

Finger Pulls Make Tiny Fuel Tanks for Tiny Gas Engines



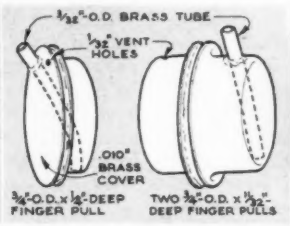
SOLDER together two nickel-plated finger pulls—the kind you see recessed in sliding doors and panels—to make a perfect fuel tank for a gas-powered model plane, boat or race car. They are available in many hardware stores and cost very little. Two of the size illustrated below make a tank weighing less than ¼ oz. that will hold five cubic centimeters—enough fuel to run a .049-cu.-in. half-A engine for about 75 seconds at 12,000 r.p.m.

A single pull, covered with a disk cut from .010″ brass shim stock (left below), will fuel a light engine with a free-flight propeller for nearly a minute.

The neoprene tube slips easily off the engine intake for refueling with an eye dropper.—*Jack Wilson, Hollywood.*

SINGLE TANK is ideal for profile models (left). Model boat (right) uses double tank.

NO BIGGER THAN A THUMBNAIL, single tank (left) packs plenty of fuel for a light engine.



Two finger pulls soldered together (right) will form a neat tank with generous fuel capacity.

Kit of Hardboard Panels Modernizes Alcove Around Bathtub

CRACKED walls around a bathtub can be repaired, waterproofed and modernized at one time with a new wall-refinishing kit. It contains three panels precut to fit standard 5′-tub alcoves, waterproof filler, metal trim and hardware. The hardboard panels are faced with a waterproof, tilelike plastic. Kits, made by Armstrong Cork, come in four colors and can be easily installed with ordinary hand tools.

Would Your Car Pass Inspection?

One out of every three wouldn't. A checkup now will make your driving safer. Here's what the experts look for.

By R. P. Stevenson

THE other day an examiner checking a car through a motor-vehicle inspection station jacked up the front end and gave one wheel a good shake.

The wheel fell off.

It took the examiner only a moment to find out why. In repacking the bearings, a mechanic had forgotten to put back the cotter pin that keeps the wheel retaining nut in place. If the car had gone another block the wheel would have dropped off and someone might have been killed.

That sort of thing has happened dismayingly often wherever periodic car inspections are required. Examiners have found steering linkages ready to fall off, tires on the verge of blowing out. They have prevented an untold number of accidents.

Human failure—carelessness, bad judgment, fatigue—can turn the safest car into a death trap, but more cars are unsafe than you might think. On the average, one out of every three automobiles you meet on the road needs some kind of mechanical attention to make it truly safe to drive. The National Safety Council made this startling discovery in a recent nationwide spot check of car conditions. Defective brakes, one of the leading causes of accidents, were uncovered in one out of every 10 cars checked.

No one can tell how many accidents have been prevented by regular car inspections. Other factors—safety education, police enforcement, rigid traffic laws—all help, too. But these impressive facts are on the record:

- Throughout the country during the last two years, 5.75 percent of the cars involved in fatal accidents had defective equipment. On the other hand, in Pennsylvania, which was one of the first states to require regular car inspection, the figure usually is less than four percent a year.
- In 1937, New Jersey had 1,278 traffic deaths. In 1938, the first year of compul-

sory inspection, the total dropped to 865—a saving of 413 lives. Every year since then, despite the fact that New Jersey registrations have doubled since 1937, the traffic toll has never risen higher than half as much as it was in any pre-inspection year.

Because New Jersey has one of the strictest of all inspection systems, and one of the lowest accident rates in the nation, it is worth your while to find out what it takes to win an okay from that state's examiners. I'm going to take you along, by means of

HOW NEW JERSEY INSPECTS A CAR

1 Come along on a trip through a New Jersey inspection station and let's see what examiners look for. If you live in one of the states that does not have compulsory inspection, what you'll learn can guide you in making your own car safe. First, Examiner Russell Elfvin checks my license cards. A 50-cent fee supports the state-owned and -operated system.

3 A power jack raises the front end and the examiner tries to rock each front wheel in succession. If a wheel rocks in and out more than ¼", the car is turned down, for it indicates dangerous looseness in the steering mechanism. While steering the car to the hoist, the examiner also gets an idea of the looseness, or stiffness, of the mechanism. The steering wheel must not have more than 3" of play.

5 At least one red tail light, and a white light on license plate, are requirements checked at rear. While driver depresses brake pedal, examiner sees whether stoplights are working. New Jersey does not yet require turn signals on cars, as some states do, but most trucks must have them. Throughout inspection, examiners watch for any miscellaneous condition that would make car unsafe.

7 To test brakes, Examiner James Bianchi stops car abruptly, operating decelerometer. Test is so severe it sometimes reveals inherent weaknesses. Brakes must stop car in 30′ at 20 m.p.h. Tubes in indicator at right register braking effort in pounds exerted by each wheel. Each pair of wheels, front or rear, should do about same work. Car is rejected if a wheel shows less than 65 percent of mate's effort. Brakes are usually designed so that one pair exerts more effort than other pair. New Jersey sets maximum for a pair at 70 percent, minimum 30 percent. Parking brake is tested, too.

the accompanying series of photos, on one of my semiannual visits to a New Jersey inspection station.

What you'll learn will help you keep your own car safe. A safety check right now—even just putting in that tail-light bulb you have neglected so long—may pay off sooner than you'll ever know. The approaching Labor Day week end always runs up one of the highest traffic tolls of any period of the year.

A car may pass down the New Jersey in-

2 With the examiner steering, I drive slowly over a treadle that operates a wheel-alignment indicator. The needle suggests I'll have to make a return trip—and I'm certain of it when the examiner punches the card that accompanies each car down the line. Any irregular camber or other condition causing misalignment of the wheels affects steering. And that affects safety.

4 Parking lights, wipers on, and blow the horn are all directions the examiner gives the driver about this time. Passing around the car, he also looks for obstructions to vision on the body, windshield and windows; makes certain the glass is all in good condition and notes whether car has a rear-view mirror. If the exhaust sound indicates a faulty muffler or pipe, owner will be required to repair it.

6 Headlamps come next, and Examiner Otto C. Klein uses the sights to line up the testing board with my car. The board checks the aim of the lamps up and down and right and left, while an electric eye shows whether the beams register the minimum 3,750 candle power required. At 25', height of upper beam of a sealed lamp must be at least 3" below the lamp center but not more than 8" below. Mine were too high. Ideally, the high beam should shine straight ahead, but a sidewise tolerance of 5" right or left is permitted. Low beams should shoot low and off to right.

8 End of the line would find examiner scraping off old sticker and putting on a new one if everything were okay. But Albert W. Godown, supervisor of New Jersey's Flemington station, hands me half of my card. Punches on it will show mechanic headlamps must be lowered and the wheels aligned. The state gives an owner seven days to make such corrections, but no more. After a visit to my service garage, I returned—and got the sticker. In six months, along with 1,700,000 other cars in New Jersey, mine will have to pass the tests again.

INSPECTION is required in only a small part of country. Delaware, New Jersey and District of Columbia own and operate their stations. Other states farm out job to approved garages. Nine states have authorized cities to make inspections, but only those listed on map do so. State of Washington has inspection setup, but it has been inoperative recently.

Is Your Car Safe?

Steering. Do the front tires show the telltale wear of misalignment? Can you wobble the wheels when they are jacked up? Have you crawled under lately and examined each part of the steering linkage for cracks or fractures? Does the car tend to wander on a straight road? Do the wheels bind on a full turn? Too much play in the steering wheel?

Brakes. Driving at 20 m.p.h., can you stop in 30 feet? Try it and see. Does the car pull to one side (a sign of unequalized brakes) when you stop? When did you last check the fluid? Does the pedal go closer than 2" to the floor before braking effort begins? Does your hand brake hold the car on a hill?

Visibility. Is your glass cluttered up with stickers? Have you installed an accessory that obstructs your view? Do your wipers work reliably?

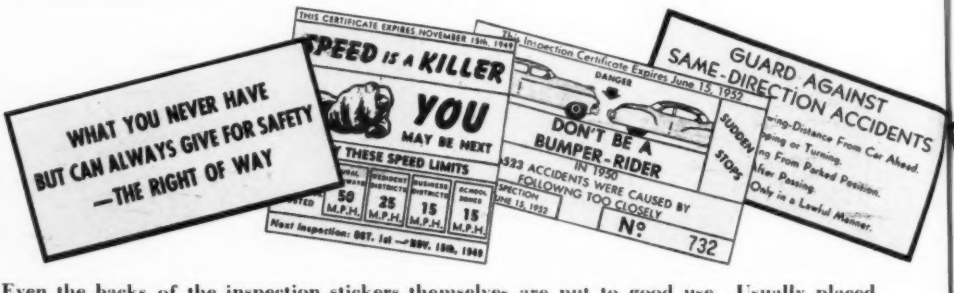
Lights. Are you driving with a bulb that has burned out? Is the red glass broken in your tail light? Do your stoplights work? Does the indicator on the dash show when your high beams are on? Are your headlamps aimed the way the law requires?

spection line and wind up with its approval sticker in less than five minutes. Yet in that time the examiners check up on a whale of a lot of things the average driver would never think of.

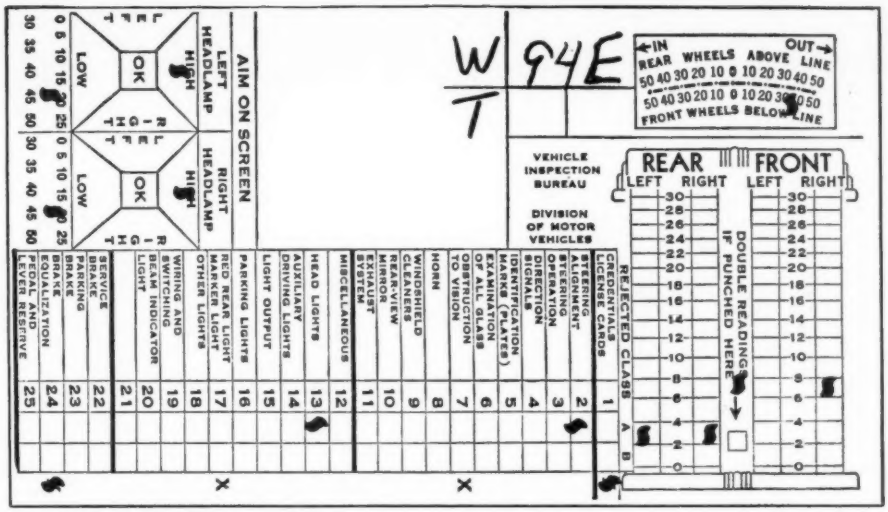
For instance, certain gimmicks and gadgets you might want to add to a car are illegal. This could include anything that obstructs the driver's vision. A bug deflector on the hood would bring at least a warning. Wind deflectors on the side windows are permitted only if they are transparent—no metal is allowed. Even clear-plastic deflectors are accepted reluctantly, for scratches and pitting eventually make them hard to see through.

When a car comes off the production line, there isn't a bit of equipment on it that wouldn't pass inspection in every state. Most makers of car accessories aim for that same universal approval. But some of them don't bother. That's why you stand a chance of trouble with the law if you install an accessory that has just arrived on the market.

New Jersey had a case like this a year or so ago. A number of drivers bought a new flasher unit designed to blink all the lights on a car, including the headlamps,



Even the backs of the inspection stickers themselves are put to good use. Usually placed



REASONS FOR REJECTION of a New Jersey car are listed on this card. Punches show why writer had to make a return trip—steering alignment was out, headlamps were too high.

if the car broke down on the highway. This sounds like a sensible safety precaution. But a New Jersey law expressly states that flashing lights cannot be used except for directional signals. The flasher unit was outlawed—it might cause confusion.

Like other states, New Jersey has rigid requirements for safety glass in windshields and windows. If the glass is broken or discolored, the car will be rejected.

Automobile manufacturers sometimes try to substitute clear plastic for glass, but New Jersey won't accept it—unless it is in the rear window of a soft-top convertible, and then only because it is usually larger, and thus provides greater visibility, than the standard pane of glass. Even so, the owner of such a car would surely get an inspection turndown if his plastic window were scratched or marred so he could not see through it.

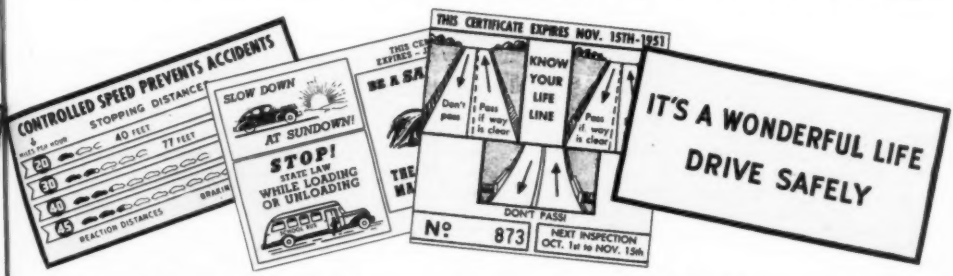
Rejections produce results in any state inspection program, for the usual penalty—unless corrections are made quickly—is suspension of the registration plates.

Sometimes these twice-yearly inspections seem like a nuisance. You can always think of something better to do on the day one comes around. But they seem much less of a nuisance when you consider this unquestionable fact:

Scattered throughout the U. S. are thousands of drivers who escaped grief on the highway because inspection uncovered and corrected mechanical faults in their cars before they could cause accidents.

Who are they? That's something no one ever will know. But one of them might very well be you. END

Next month PSM will present a fact-filled article telling "How I Learned Arc Welding."



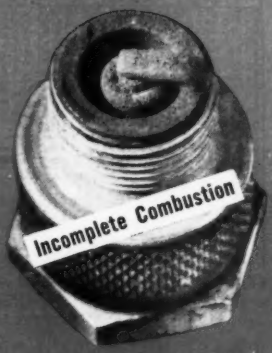
where they are easily seen, they carry safety messages to remind the driver to travel with care.

Your Spark Plugs Can

TACK UP THIS PAGE IN YOUR HOME GARAGE

POWDERY DEPOSITS ranging from rusty brown to grayish tan are a sign of a normal plug of the correct heat range used in a properly operating engine with unleaded "white" gasoline. You may also find some minor electrode erosion.

GRAY POWDERY DEPOSITS show plug has been operating under normal conditions on highly leaded gas. These deposits have no effect on performance if plugs are cleaned regularly. Otherwise, the plugs may become badly fouled.



DRY BLACK FLUFFY DEPOSITS indicate incomplete combustion. Causes: over-rich fuel mixture, defective ignition, faulty automatic choke, excessive use of hand choke, clogged air filter, stuck valves, or the wrong type of plugs.

BLACK OILY DEPOSITS, usually known as oil fouling, are traceable to excessive amounts of oil entering the combustion chamber because of worn rings, pistons, valve guides, bearings. Hotter spark plugs may help temporarily.

BLISTERED INSULATOR NOSE and badly eroded electrodes are a sign of overheating. This condition may be caused by improper ignition timing, a faulty cooling system, excessive carbon deposits, improper fuel, or the wrong type of plugs.

EXTREME DAMAGE to a plug sometimes results from careless installation. In this case, tiny pebble under gasket prevented a good seal. Escaping heat of combustion then caused the harm you see above before the car had been driven 1,000 miles.

Tell a Story

It's as plain as what you see on their noses if you know what to look for and how to read it right.

MANY a motorist has been mystified by the way an expert mechanic can pull the spark plugs out of a limping engine and then put his finger on a completely unrelated trouble spot, a clogged air filter for instance.

Learning to use spark plugs as automotive clinical thermometers is good practice for both shop and home mechanics. Plugs are dependable guides in analyzing a surprisingly large number of engine ills. Photos on the facing page show you what to look for and how to read what you find.

Normal deposits. Thin powdery deposits varying in complexion from rusty brown through tan to gray are normal and have little or no effect on plug performance provided you have the plugs cleaned periodically, say every 4,000 to 5,000 miles. If allowed to accumulate, lead deposits can produce a yellowish glaze that will eventually foul the plug.

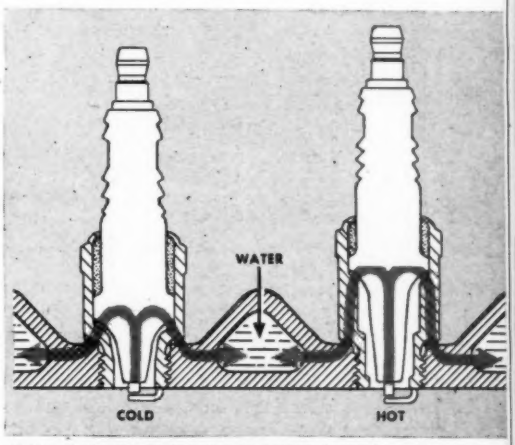
If you find the telltale black deposits of incomplete combustion on only one or two plugs, examine individual ignition cables for worn insulation. The trouble could also come from a couple of sticking valves or a gummed intake manifold. As another trick, you might compare the identifying numbers on the fouled plugs with those on the normal ones. It just might be that the fouled plugs are in the wrong heat range.

Know your heat range. This is important. Engineers at Champion Spark Plug testing laboratories at Toledo report that too many motorists—and mechanics—merely install plugs that fit with no regard for operating conditions of individual vehicles.

Understanding the function of hot and cold plugs can cut down both your fuel and repair bills. A hot plug doesn't deliver a hotter spark, as many think. Instead, it is designed to retain more heat—and fire better—when combustion-chamber temperatures are relatively low. A cold plug is built to conduct heat rapidly away from the firing end.

If you use your car mostly for short hops, start and stop a lot, wait in Sunday jams with the engine idling, then your car should be equipped with hot plugs. In this type of driving, the temperature of cold plugs stays so low that normal combustion deposits are not burned off. Fouling results. Conversely, if you give your car a hard time, choose cold plugs. Hot plugs under this type of service get too hot and cause preignition.

If your plugs show badly eroded electrodes and scorched insulator noses, the need for a colder type may be indicated—though not always. This may also come from a faulty cooling-system thermostat, clogged water passages, improper timing, excessive

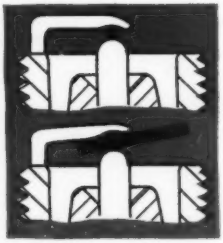


HOW COLD AND HOT PLUGS DIFFER is indicated by the heat-transfer arrows in this sketch. Cold plugs are designed to disperse combustion heat rapidly to the water jacket, hot ones to retain it. Cold plugs are best for high speeds, long distances, steep grades, heavy loads. Hot plugs are better for lighter service.

carbon in the combustion chambers, the wrong type of fuel, or improper plug installation. If only a few plugs show evidence of too much heat, you can be fairly certain of a clogged water passage in the vicinity, provided the plugs were properly installed.

Oil sludge, wet and gummy, is a dreaded sign that your engine is weary, worn and needs overhauling. Worn cylinders, piston rings, valve stems or bearings are common causes, but a porous or broken diaphragm on a vacuum booster pump can also be the culprit. This permits oil to be sucked into the combustion chambers through the intake manifold.

Plugs with cracked or broken insulators should always be discarded. A careless blow with a wrench may crack a top insulator. A broken insulator nose almost always is the result of an attempt to bend the center electrode instead of the side one in setting the gap. New plugs are also called for when the side electrodes are worn paper thin and the center ones have eroded.

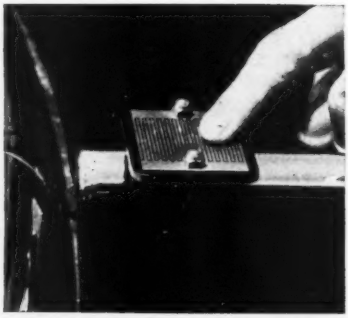


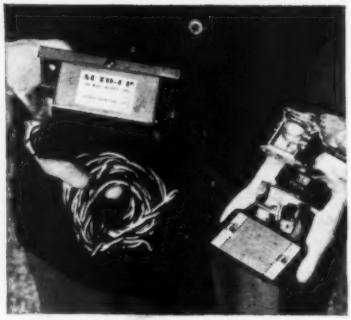
USE WIRE GAUGE instead of a flat one to gap a plug. Sketches above show why only the wire will give an accurate measurement if the side electrode has become pitted.

Engineers at the Champion laboratories report that proper removal and installation of plugs is more important than you may think. To remove a plug, loosen it about two turns with the correct size of deep socket wrench. Then wipe or blow away dirt and grit from the port before lifting out the plug. This keeps abrasive material from tumbling down into the cylinder and lessens the possibility that grit or even a tiny pebble may get under the sealing gasket when you put the plug back.

Treat the gaskets with respect. If a gasket is compressed too far or not enough it permits leakage from the combustion chamber. That is why you should use new gaskets each time and be careful about tightening the plugs. A torque wrench is the perfect tool for the job. END

Convertible Buttons Itself Up When Rain Falls





If it rains, a new auto accessory automatically buttons up any convertible equipped with power windows and top. Water triggers the mechanism.

You mount an electric grid (right above) outside the car. Moisture hitting this completes the circuit, and a relay switches on the top- and window-raising systems. The moving window and top operate circuit-breaking switches just before they reach the full up position. The system then shuts down—and rain can't damage the interior of the car.

A manual switch disconnects Auto-Up so that the top won't go up automatically while you drive.—*Superior Engineering Corp., 49 N. E. 22nd St., Miami.*

Which Blowouts Are Worse?

Keep the best tires in front, the experts once advised. But recent proving-ground tests show that back tires are riskier.

IF YOU had to use two well-worn tires, where would you mount them for greatest blowout protection—in the rear or the front?

Drivers have been wondering about this ever since pneumatic tires were invented. Usually they've elected to put the best tires in front. But now it seems that this is wrong. On a straight road, rear-wheel blowouts are generally more hazardous.

This is the conclusion drawn from a series of tests—involving several hundred artificial blowouts on a proving ground—conducted by a large auto manufacturer. The tests also showed that:

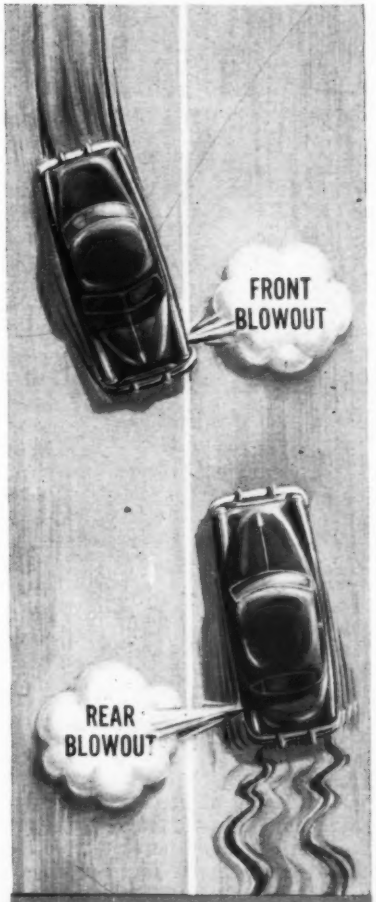
- Even at high speeds, a blowout is not particularly dangerous if the driver is alert and knows how to control his car.
- Oversteering and excessive braking are what may make a high-speed blowout hazardous.
- Improvements in tire design and construction are making blowouts rarer now than in the past.

When a rear tire blows at high speed, the car becomes quite unstable at the rear. Often it "fishtails." A good driver can quickly control this; an inexperienced or inattentive one is apt to overcorrect or correct too late. This can increase the oscillations and lead to disaster.

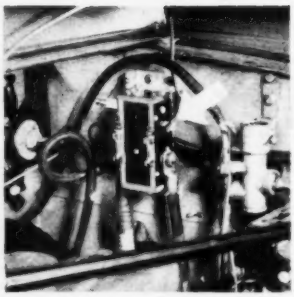
When a front tire blows, there is an immediate strong pull to that side. If you are holding the wheel loosely, it may whip past your fingers. You must exert considerable force to overcome the drag and turn the wheels back straight. What you naturally tend to do is the correct thing, unless you overdo it and pull the car into an opposite swerve.

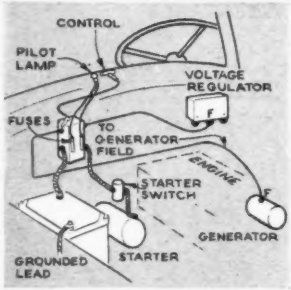
Hitting the brakes hard right after a blowout is just asking for it. If the blowout is in front, this can cause the car to swerve even more. If it's in back, instability is increased. The best rule is to stay off the brake until you have established directional control.

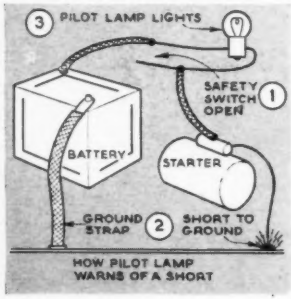
On a curve an outside-tire blowout throws a car off course most, since the outside tires carry the greater load and the greater proportion of the cornering thrust. Where the outside ditch or road shoulder offer special hazards, the blowout of an outside front tire may be relatively more troublesome than that of a rear. But except in such special cases, it's the rear blowout that's the more dangerous.—*R. P. Stevenson.*



ACCIDENT ABOUT TO HAPPEN. Rear tire of lower car has blown out, fishtailing the rear and causing the vehicle to weave down the highway. Left front tire of top car has let go, swerving it toward traffic. Which car would you have the best chance of controlling?

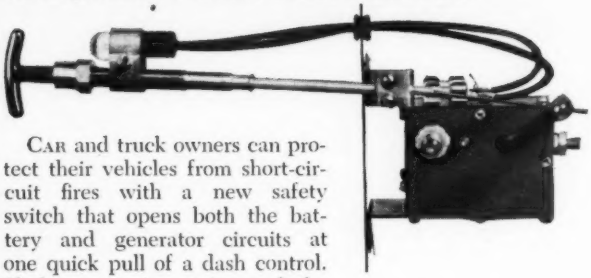






HOW PILOT LAMP WARNS OF A SHORT

Safety Switch Guards Car from Fire



CAR and truck owners can protect their vehicles from short-circuit fires with a new safety switch that opens both the battery and generator circuits at one quick pull of a dash control. If the car is in motion and the driver sees smoke coming from the hood, pulling the control will kill all circuits, giving him a better chance of controlling the fire.

The Mak-Saf switch also provides a way of checking for shorts before fires occur. If you pull out the control to its full extent after parking, a signal light will remain on until all battery-draining accessories are switched off. If the light continues to glow after these are off, you know there's a short somewhere in the system.

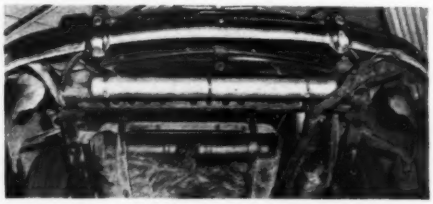
The pilot lamp can give this warning because it is connected across the terminals of the switch that breaks the main battery circuit. If an accessory switch or short completes the circuit to ground, the lamp will light. In the case of a short, the ¼ ampere that the lamp passes is insufficient to start a fire. Pulling out the control, therefore, protects the vehicle from an electrical fire while garaged or parked.

Pulling the dash control out halfway breaks only the generator circuit. Driving with it in this position, you have a bit more horsepower available to propel the vehicle, for generator drag normally absorbs some of the engine output. At the start of a race, hot-rodders sometimes disconnect the generator by hand to save power. *Rochester Manufacturing Co., 100 Rockwood St., Rochester 10, N. Y.*

Sliding Weight at Rear of Car Reduces Skids

A 40-POUND bar of cast iron has been put to work cutting down tire squeal and skidding. The device straps to the rear cross member of a car. The bar is held in a steel tubular housing by heavy springs at the ends. It floats on ball bearings.

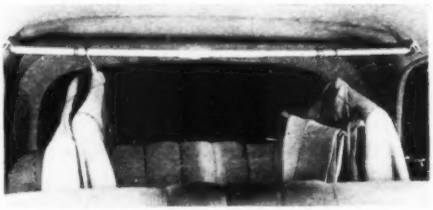
When a skid begins, the rear end of the car moves sharply to the side. The tube moves with it, but because of inertia the weight inside stands still, compressing the spring on the opposite side. This tends to overcome the skidding momentum of the car. If the rear of the car whips back and forth, the shifting weight steadies the movement.



The device, used on both passenger and racing cars, is called Gyro-Skid Control.

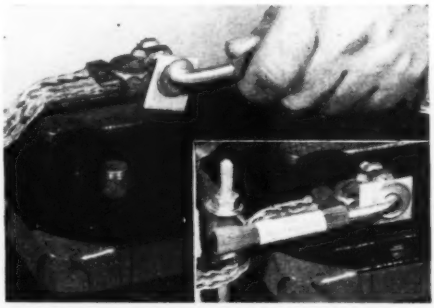
Repair Panels Make Rusted Fenders Look Like New

IF REAR fenders rust out along the lower edges in older models of Kaiser-Frazer cars, the dealer can sell you repair covers at a third of the cost of replacing the fenders. The covers fit over and hide the rusted area. Similar covers are available for the rocker panel, the strip below the doors. The panels are attached after rust is sanded away.



Telescoping Tube for Clothes

MADE of aluminum, this telescoping clothes rod hooks to the two garment hooks that are standard equipment in most cars. *Young Products, 2605 Elmhurst, Detroit 6.*



Built-in Wrench Cuts Current

IN CASE of an ignition fire, this device makes it possible to disconnect the battery ground cable quickly. You install the Zak Auto Fireman in place of the cable clamp bolt. Turning the handle 180° loosens the nut and clamp sufficiently so that the clamp can be lifted off the post. *Park Sales, Box 73, Forest Park, Ill.*

Plane-Type Plug for Cars

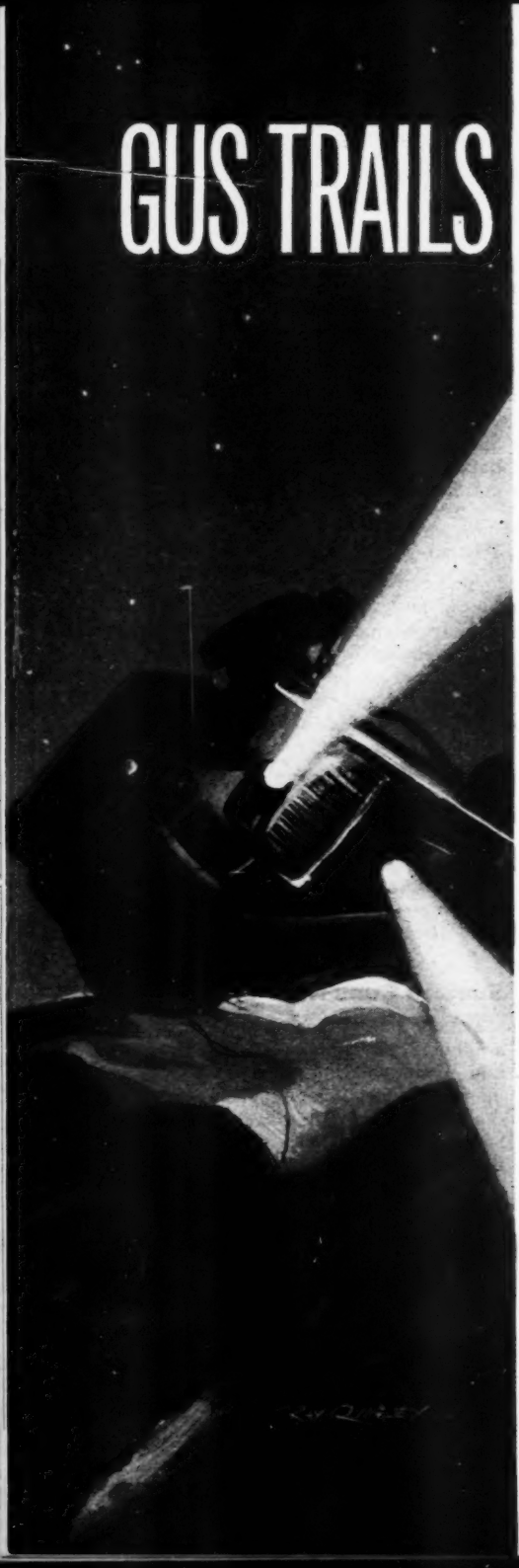
SHROUDED spark plugs, long used in aircraft engines, are now available for cars. The shroud surrounds the electrodes, protecting them from combustion heat. The plug has two ground electrodes, said to provide a doubly sure spark, less gap growth and longer life for the plug. *Hastings Manufacturing Co., Hastings, Mich.*

Suction Cups Hold Visor

PULLED out of the trunk and installed in a minute, this temporary plastic visor keeps rain off the windshield while you watch an open-air movie. It can also be used as a sunshade when you park to watch a ball game. Suction cups hold it fast. *$1.79. Red Top Products, 1839 Parker St., Springfield, Mass.*

GUS TRAILS A HOT CARGO

Trouble shooting was Gus's stock in trade, with Officer Ryan wasn't the kind



TALK of the weather . . . there had been nothing else all that day. Over soda-fountain counters, from behind desks, on the streets, it was talk of summer heat and the touch of high mercury, the kind that softened asphalt and sent heat-ghosts dancing over the sidewalks. It had even penetrated the usually cool depths of the Model Garage. Heat and the Saturday rush had made it a long day for Gus Wilson, and when he stepped out into the cooler embrace of evening, he was dead tired.

The thought of tomorrow, the one day's respite, was nice, the treasure sitting at the end of a long week's work.

Trouble on Saturday Night

A voice punctured the daydream: "Hey, Gus!" Officer Billy Ryan of the local police coasted up in his patrol car. "Got a minute?"

"What do you want, copper?" Gus ribbed him.

"I've got trouble with this machine!"

Gus eyed the aging automobile with mock disapproval. "What do you expect from a 15-year-old jalopy?"

"It's got a new motor! Besides, when are you taxpayers going to get me a new one? Now listen—"

"I'm tired, and I've closed down. Where's your police mechanic—Joe Snarky?"

"He's sick in bed. Listen, Gus. Tonight I got a tip from the police down in the city that some hijackers are going to pull a fur-coat job with their truck near here a couple of hours from now. East of town. And this car's liable to poop out and ruin the whole setup!" Ryan was excited.

"Okay, calm down before you fade your hair. What's the trouble?"

"Wait here, Gus," Ryan said.

By Martin Bunn

but chasing hijackers of trouble—or shooting—he had in mind.

"The engine dies and the lights go out every time I put on the brakes. Even if I just slow down. Have to come to a full stop to get started again."

Gus sighed. "Run her into the garage. I think you're shorting out somewhere."

Gus rolled the doors back up and turned on the lights. He pried up the small inspection plate in the floorboard of the old car and took a fast look.

Quick Checkup Yields No Clues

The battery was brand-new, still shiny black. Gus raised the hood and checked the wiring in the primary ignition circuit from that end. Still nothing.

He pulled on grease-stained coveralls and crawled under the car with a trouble light.

"Can't you hurry it up, Gus?"

"I hate to admit it, but I am hurrying. Shouldn't hurry with auto repairs. Too many mistakes that way!"

The stoplight switch on the brake pedal, a common source of shorts, proved okay. Then Gus checked the battery cable down by the brake arm. The action of the arm could wear the insulation off and short the battery out every time the brake was used. But that was okay, too.

"How about the generator, Gus?"

A Nice Night for a Ride

Gus didn't answer, but in a moment, he crawled out looking puzzled.

"Generator, did you say? No, if that were the case you'd be running your battery down. It wouldn't account for your engine dying. I can't find a thing. You should have come in earlier!"

"I meant to, Gus, but they kept me tied

"I'll go look things over."

up all afternoon. Safety lecture at the high school. Then I got this tip from the big-town cops."

Gus checked the ignition and lighting wires, tracing them down to the firewall where they passed through to the engine side. Then he climbed out and turned the light off with a click of finality.

"I'll be darned. Well, let's take it for a ride."

Gus backed the car out and started down the street. The street lights were on now, and a haze-yellow moon painted the tops of the low hills outside of town.

"It's a pretty good night for changing pumpkins to coaches, isn't it, Billy?"

"Good for switching fur coats from one truck to another, you mean!"

Gus drove to a quiet road east of town, out among small farms and country lanes that were quietly beautiful in the moonlight. There, free of evening traffic, he punched the brake pedal hard.

The front end dropped slightly, the engine quit and the lights flickered out. He had come to a full stop.

"I see what you mean."

"What do you think it is, Gus?"

"Oh, it's still a short somewhere. The problem is the somewhere! This promises to be kind of tough with so little time to work in. How about that other police car, why can't you use it?"

Ryan's face reddened. "It was smacked by a hit-and-run. And George Weaver didn't get the number. Everything happens to the department today!"

Cops Are Only Human

"How about letting the highway patrol take over?"

"Aw Gus, you know how it is . . . your pal, Sergeant Corcoran, would kid the pants off me."

"Okay, Billy, I'll keep trying."

Gus hit the brake again, this time a little slower. The engine kept running for an instant longer than before.

"I think we have something now. Once more."

He got into high gear, worked up to 40 miles an hour, and then put the brake on gradually. They slowed down gently, and rolled to a full stop. Neither engine nor lights failed.

"That settles it. Maybe a wire swinging against metal. If you slow down real easy, the wire doesn't swing far enough to touch."

Suspicious-Looking Truck Roars By

Gus got out and crawled under again. The breeze and roar of a truck going by at high speed caught at his pants legs, and a split second later, Ryan let out a yell.

"Hey, get back in! I think that was the hijackers' truck!"

Gus leaped back in, and Ryan started out with a squeal of rubber.

"Something's gone haywire. Those birds are early!"

The small truck moved fast over the narrow road, its tail lights bobbing in the darkness ahead.

Ryan switched off his headlights so that the truck driver wouldn't see them follow, and Gus felt something tighten in his stomach. He hadn't bargained on getting involved in a cops-and-robbers chase.

"What makes you think that's the hijackers?"

"The truck fits the description—and who else would be burning up the road like that? If I can get close enough to see the license plate, I can be sure."

"Okay, what do we do now?"

"Catch them in the act of switching the load, I hope. You see, these fur coats are taken by truck to a warehouse in Buffalo. Then they're distributed to stores. A couple of the company drivers are working from the inside for the hijackers. Recently one of them was stopped, beat up to make it look real, and the furs trundled off in another truck. And it's nothing small—mink and stuff like that. One company driver decided he didn't want to get in any deeper and tipped the police off to this second job—that's how we got a description of the trucks and the license numbers."

"I'm afraid to ask," put in Gus, "but where do we fit in?"

"Highway patrol cars are posted at several points beyond the mountains ahead," continued Ryan, "but in the meantime,

[*Continued on page 214*]

Dizzy Definitions

Overdrive—Driving your car too much.

Oil Bath—What the mechanic has before the day is over.

Sealed Beams—Scotch tape over the headlights.

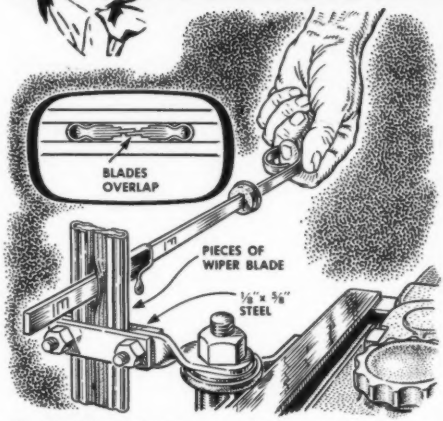
Tire Boot—Kicking a tire to see how much air it's got.

Torque—It goes on around the shop all day.

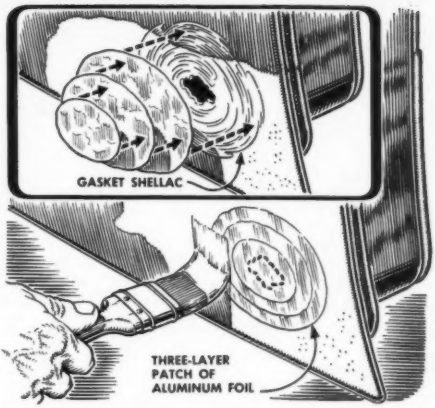
Shim Up—To climb up on top of the car.

Clutch Pedal—For emergency stops only. You usually use your foot.—*N. Rosenberg.*

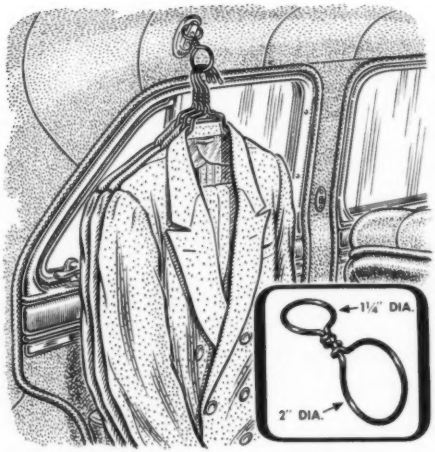
Hints from the Model Garage



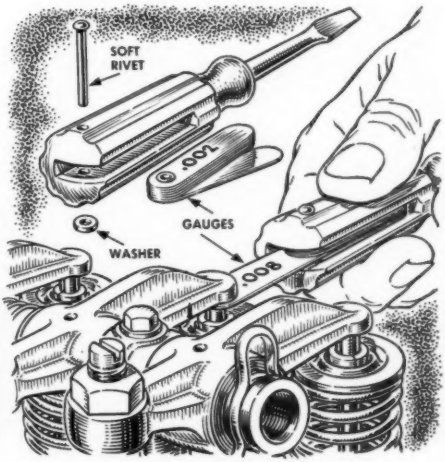
A dipstick cleaner can be made from two old windshield-wiper blades. Clamp them between two pieces of steel with the rubber slightly overlapping. Mount the assembly in any convenient spot under the hood where the dripping oil can fall free.



To patch a small hole in a car body, sand the metal smooth, apply gasket shellac, let it get tacky, and press down a piece of aluminum foil. Let cement harden, and cement on two successively smaller pieces. Sand edges of foil, paint patch to match.



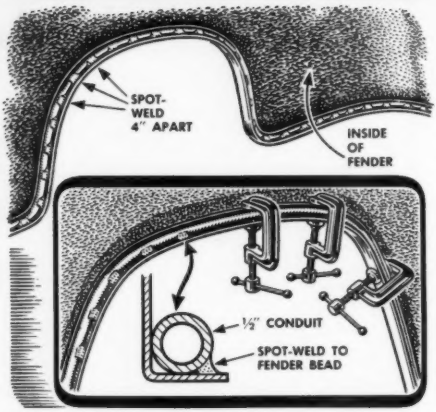
Double-looped wire formed like this will enable you to carry seven or eight coat hangers on the standard hook found in the rear of most cars. Cut wire from a hanger and form the loops by bending around a flashlight or broom handle.



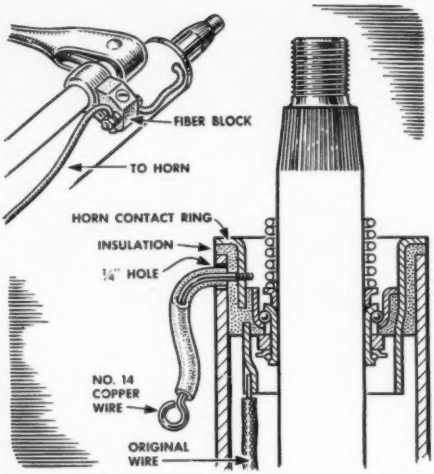
A feeler gauge and screwdriver are the tools you use most for setting rocker-arm clearances, so it's a help to combine the two. The gauge can be put into either a wood or plastic handle by carefully routing out a slot just big enough to take it.

Please turn the page for more auto hints.

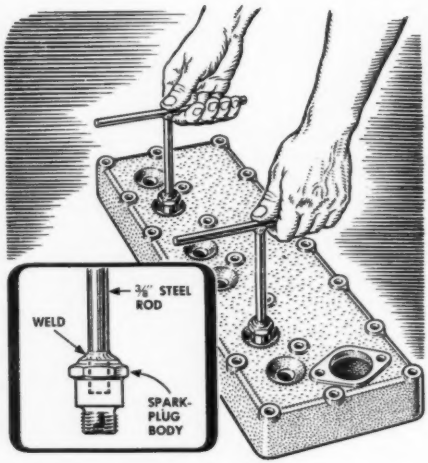
MORE Hints from the Model Garage



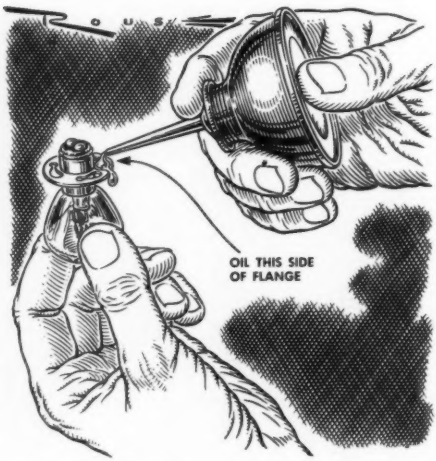
If the fenders of an old car have cracked at the edges, they can be given new strength by welding a piece of ½" electrical conduit inside the bead. The conduit will bend easily to the contour of the fender. Clamp it in place until the welding is finished. Keep the welds inside the bead to avoid damaging the finish of the car.



When a horn wire breaks inside the steering column, you can bypass the break by running a wire down the outside. Drill a ¼" hole in the column at the point shown. Then drill a No. 53 hole through the insulation and contact ring. Tap this for a threaded piece of No. 14 wire, insulate the wire, and connect to a junction block on the column.



Lifting a cylinder head will be a lot easier if you make a couple of T-shaped handles like this. Knock the porcelain tops out of a pair of old spark plugs and weld them to handles made from ⅜" rod. To use, screw into the plug seats.



Apply light oil to the flange when you install a prefocused headlight bulb in an older car. This will make the bulb easier to remove when necessary. If corrosion should form, the bulb will not freeze fast to the socket assembly.

A box structure extends the floor . . .

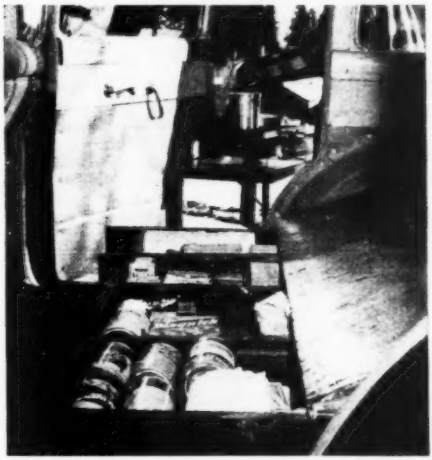
. . . giving plenty of space for a bed . . .

Bed and Board in a Station Wagon

When the back seats are removed, most station wagons have ample room to sleep two campers. In some, however, the floor has an offset or other hazard not conducive to a good night's sleep. Here's how one outdoorsman leveled the floor in his 1951 Pontiac.

A boxlike structure extends the level space available for sleeping. Nor is this all. Lift the leather-hinged lid on the box and there is enough space to store a week's supply of groceries for two. Pack up a gasoline stove and a few cooking utensils—and you have all the necessities for a good long trip.

. . . Open the box and you find a cupboard.

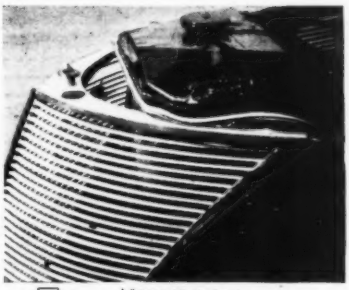


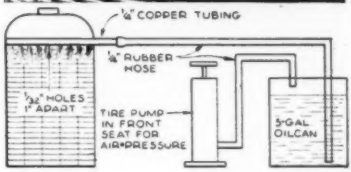
Shower Bath Cools Car Radiator

Water sprayed over my car's radiator keeps the engine from overheating when I have to tow a heavy trailer up a long grade.

A piece of ¼" copper tubing is fastened across the front of the radiator at the top. Rubber tubing connects it to a 5-gal. can in the rear seat, and a tire pump supplies air pressure to force the water out. Twelve 1/32" holes in the copper tubing let the water spray down over the radiator. The fine streams vaporize when they strike the hot metal, and we've had no trouble with wetting down the ignition system.

I've taken heavy overloads over many mountain passes with this rig, even on prolonged low-gear climbs.—*Al Tappel, Davis, Calif.*





Speaker Box Improves TV Sound

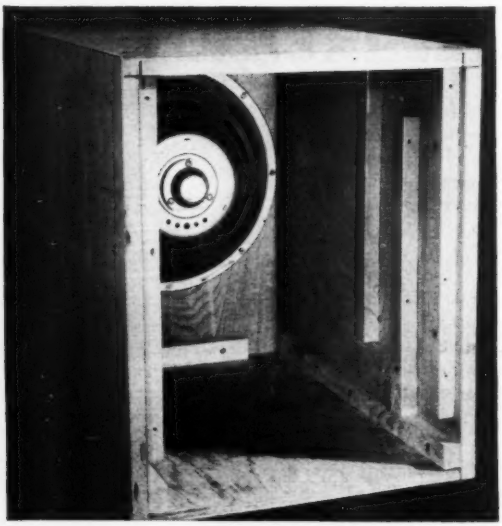
By John P. Kenneally

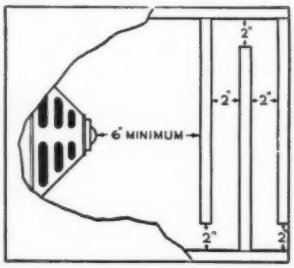
SPEAKER BOX, screwed to underside of TV table, blends nicely, takes little room. This box was made of ¾″ white mahogany lumber-core veneer; baffles and back cover, ½″ fir plywood. Box could be merely set on floor below table, or table legs enclosed to make a permanent box. If TV receiver swivels on table, connecting wires must be long enough for this.

If squeaky, high-pitched voices are spoiling the show, a separate speaker will add console tone to your table set.

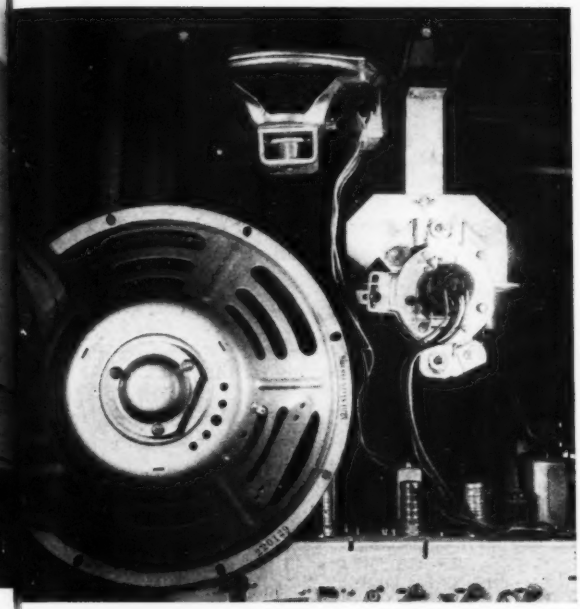
DO YOU have one of those table TV sets with the sound coming from a little hole in the side or top of the cabinet? I have—the speaker was aimed at the living-room wall—and without looking I could hardly tell Kate Smith from Arthur Godfrey.

The simple box shown here has changed all that by bringing better TV sound to our





REAR VIEW of box (left) shows 1″ cleats that support baffles and rear cover. Box size is not critical, but should be at least 16″ wide by 18″ high by 20″ deep. Larger boxes should be lined with sound-absorbing material to prevent "booming." Celotex or an old rug will do. Uniform space of 2″ above, below and between baffles (above) is necessary for best acoustic quality.

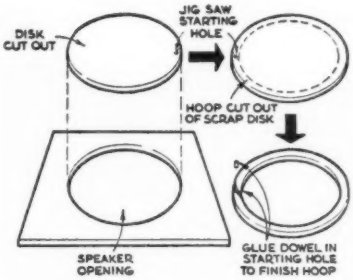


TINY ORIGINAL SPEAKER, shown at top of photo at left, was aimed at ceiling in this set. It had a shrill tone and overloaded easily. New 12″ speaker (foreground) will do a much better job of reproducing sound, but will have to be mounted under table. New speaker will give most realistic sound if aimed in same direction as screen.

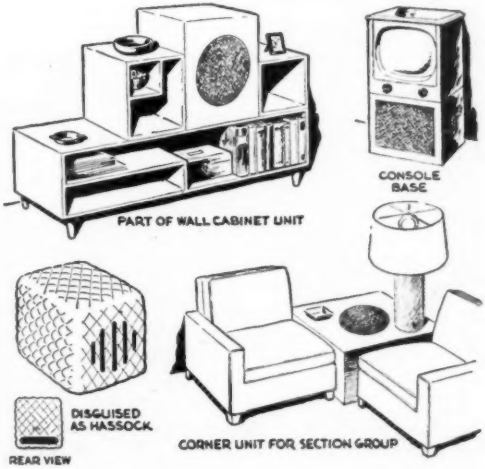
DISCONNECT OLD SPEAKER and extend wires to new one. Here, output transformer is mounted on speaker frame, so old speaker is not removed. Unsolder the two uninsulated leads (indicated by pencil) running to voice coil at center of speaker and splice them to a two-wire cable leading to new speaker. If present speaker is dynamic type, extend voice-coil wires as above, leaving field-coil wires intact; they may be part of the circuit.

home. Inside the box is a new 12″ speaker (cost: five bucks) and a set of sound baffles. The new speaker replaces the little 4″ squawker that came with the set. The baffles improve the efficiency of the larger speaker, enabling it to sound off with crisp, clean low notes.

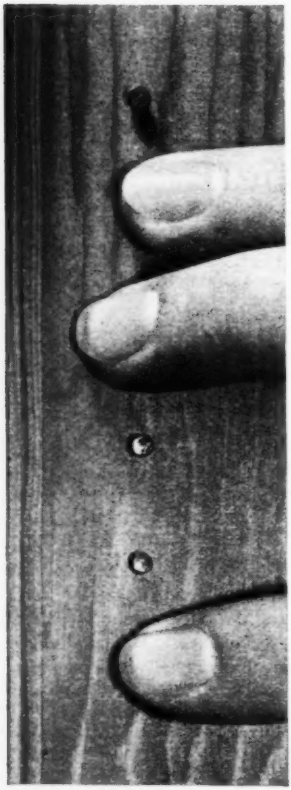
TV sound is transmitted via FM and should be of pretty good quality. The bottleneck, however, is usually the speaker itself. TV manufacturers just don't have room in their table-model cabinets for any but the smallest speakers. The photos on these pages show how you can tie a larger speaker to your set to make a noticeable improvement in your sound system. END



HOOP FOR GRILLE CLOTH is cut out of scrap disk from speaker opening (above). Plug starting hole for jig-saw blade with glued-in dowel to make hoop solid. Sand smooth, lay cloth over hoop and force into opening from inside of box. Secure with three brads and trim excess cloth. At right are more suggestions for speaker boxes that will add to your living room as well as your listening.



Electric Combination Unlocks Your Door



BUTTON, BUTTON—but which ones? If you don't know, you can't get in. Here the combination is 2, 3 and 6. Electric door opener (right) replaces strike in jamb. Latch must be a type that can be locked. Buttons set into panel are cut from finishing nails (below).

Wire your workshop, den or garage for privacy. The key will never be farther away than your fingertips.

By Eugene M. Hanson

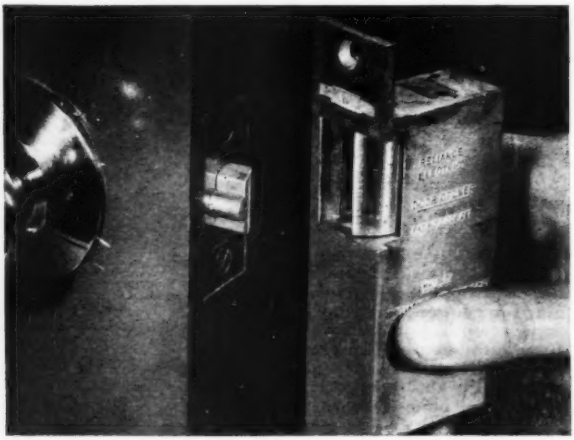
A DOOR that opens at a touch. But only for your touch, not for anybody else's. Something for the "I'd Like to See Them Make" page? Nope.

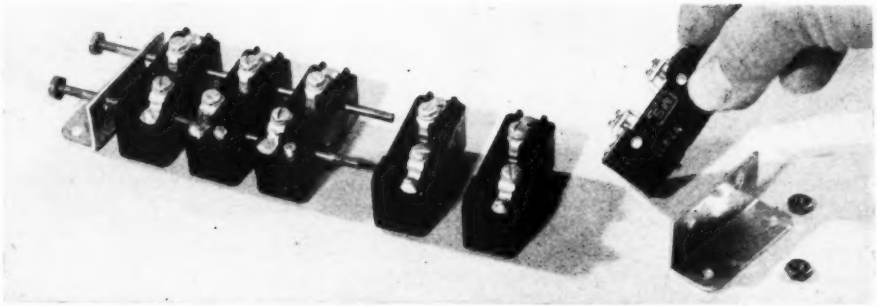
Here it is: an electric lock, controlled by inconspicuous push buttons arranged in whatever secret combination you like. There is no key or padlock to mislay, and the rig can be wired to set off an alarm if it's tampered with.

The door latch must be the type that locks with a key from the outside, but you simply file the key away for use in case of a power failure. The electric strike withdraws when energized to free the bolt.

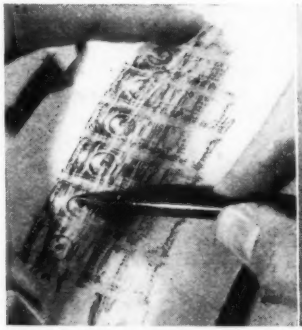
You can buy a door opener to fit into a mortise as shown, or for surface mounting. The switches are the midget snap-action type. Three are the normally open kind (which close a circuit when pressed). The others are the normally closed kind, which open a circuit when pressed. Some snap switches with three terminals can be hooked up to work either way. These are excellent because they enable you to change the combination any time by simply shifting the wires.

To open the door, you must press the normally open switches without touching any of the normally closed ones. (If you do, the circuit stays open.) The switches can be mounted behind the door, with only the buttons visible.

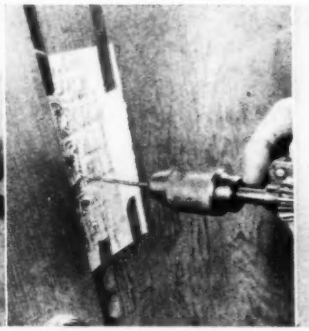




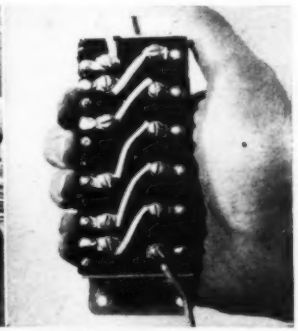
LAY OUT SWITCHES in the combination you decide on. Assemble with two long bolts or threaded rods through the holes in the bodies. Mount on metal angles or small wooden blocks.



TO MAKE A TEMPLATE for mounting the switch unit, lay a strip of paper over it on the button side. Rub a soft pencil over the paper. You will get a lead-pencil imprint of the switch pins.



FASTEN TEMPLATE with tape to the door, wall or jamb where you will be able to reach buttons and door handle simultaneously. Drill a small hole at each of the switch-pin marks on the paper.



WIRE SWITCHES in series. This shows rear of assembled panel, which must of course be mounted inside so that terminals can't be shorted. It can go behind the door panel, if flexible leads are used.

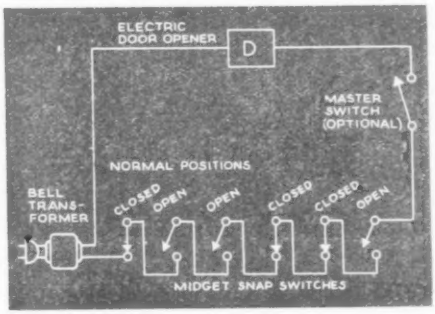
Even if the buttons show, it would take a would-be intruder a long time to try out all the countless combinations possible.

The switches shown have tiny pins that protrude about 1/32″. Some have levers that bear on these pins. For compact mounting, remove the levers. To actuate the pins, set finishing nails in holes in the panel or molding behind which the switches are installed. Spot these push buttons as inconspicuously as possible, but remember you must be able to reach them and the door handle at the same time.

You can change the combination any time by rearranging the switches or (if they are the three-terminal type) by rewiring them. You can add more switches to increase the number of possible combinations and make the setup harder to "break."

Another refinement is a secret master switch, which you leave turned on except when you are away. Anyone seeing you use the combination won't suspect there is another switch, so even spotting the buttons won't let him in.

The combination lock has only one weakness—it's so fascinating you'll want to show everybody how it works. END



How to Pour a Twin-Track Driveway

Concrete gives you a permanent drive, and the two strips keep the cost down.

PARALLEL strips of concrete are perhaps the cheapest and easiest of all permanent drives to lay down. If not too long, you can finish them in a week end without straining your back or pocketbook. And you end up with an all-weather entrance that eliminates muddy feet or gravelly grass.

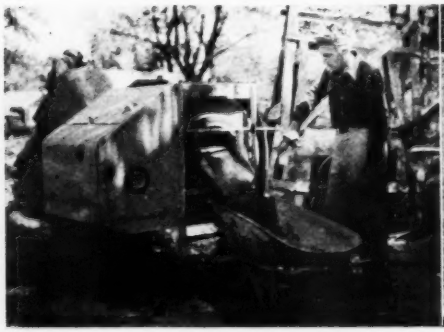
Four inches of concrete will take passenger-car weight, but if fuel trucks or other heavy loads are going to use the drive, it's better to pour 6″. Up to 6″ of gravel or cinders should be used under the strips as fill if the ground is not well drained. You can skip the fill where the soil is dry and well compacted.

Space the strips 24″ to 30″ apart, and make each one at least 24″ and preferably 30″ wide. The tread of most modern cars is around 58″, though a Crosley's is only 40″ and a big Caddy's is 66″.

Mix your concrete in these proportions: one part Portland cement, two parts sand and three parts gravel. Use about 5½ gallons of water to each sack of cement, unless the sand is wet. Then use five or less.

1 FORM EXCAVATION. String cord as guide lines throughout length of driveway. Dig narrow trenches along cord to take forms.

2 WOODEN FORMS. Two-inch boards, 6″ or 8″ wide, are best, but 1″ planks will do if they are well staked. Use level to align their tops.



5 MIXING. In most communities, you can rent a small mixer for a few dollars a day. Mixer is recommended as a time and labor saver.

6 SCREEDING. Lay a two-by-four on edge across top of form boards. Move it back and forth as you pull it along to level the concrete.

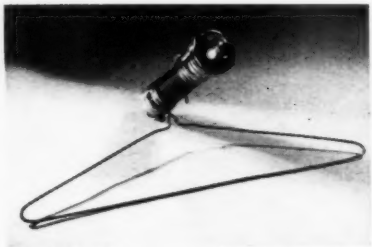
3 STRIP EXCAVATION. After form boards are set and nailed to stakes, dig out soil between boards for 6″ of cinder or gravel fill.

4 FILL. This is especially important in soils that are not well drained. Mixture of sand and gravel, well tamped, was used here for fill.

7 FINISHING. Several hours after the concrete has been placed, go over it with a wooden float to produce an even, gritty surface.

8 JOINTS. Use edging tool to divide strips into 18″ sections. Also run tool between form boards and concrete to smooth strips' edges.

DO IT THE EASY WAY



A flashlight support that will put light on your work yet leave your hands free can be made from a wire hanger. Bend the hook end till it stands steady.

A pouring spout converts a Mason jar with two-piece lid into a handy canister. The top of a salt box, cut to fit the screw-on lid, provides the spout.

To find a screw in mixed hardware, empty the container onto a square of window screening. Rust and dirt will sift out as you search, and the screen can be bent to funnel stuff back into the storage box.

To corral plugs of switchless appliances that are always used in the same spot, tie them near the outlets as shown. If there is nothing handy on which to fix the string, anchor it under the screw that holds the cover plate.

Improved Shaper Jig Supports Work from Start to Finish

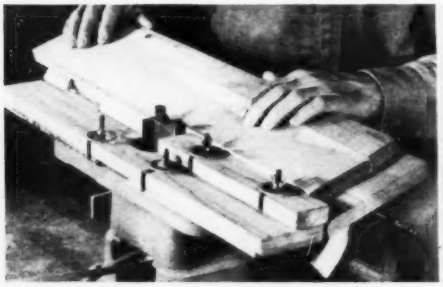
For a uniform beveling job on the shaper, as in making sections for a hollow column, you need a jig. Most types support the work all right until it is past the knives, but then bear only against the sharp edge of the bevel. If the edge breaks, support is lost, the cut deepens, and the bevel will be stepped. To lick this problem, the jig shown here has an adjustable guide that bears against the *face,* not the edge, of the bevel.

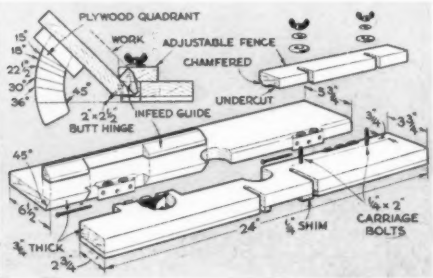
The infeed guide is screwed to the tilt table, and tilts with it; the outfeed fence is mounted on the stationary table, and is slotted transversely to adjust it to the cut. Regardless of the angle of cut, both the square edge and the jointed bevel edge of the work slide upon a flat surface.

Slots in the fixed table for the hold-down studs permit adjustment of the depth of cut. A ¼″ shim elevates it to allow easy tilting of the work table.

The quadrant, cut from ¼″ plywood, is screwed to a block on the underside of the tilt table; it is clamped to the shaper table to support the table when tilted.

The quadrant is calibrated by making trial cuts until accurate settings are obtained, and then scribing lines to coincide with the top of the shaper table.—*Edwin M. Love, Palmdale, Calif.*





Altimeter Forecasts the Weather

Surplus gauge is sensitive barometer, and it's fun to have one in the car, too.

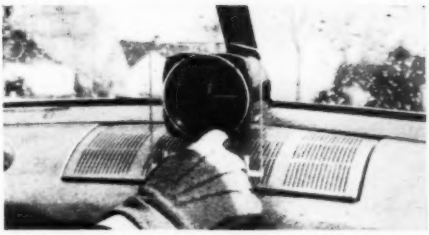
TOMORROW'S weather usually sends advance signals. Knowing how to read them can help you plan your days. Barometers—instruments that measure atmospheric pressure—foretell the weather's whims with surprising accuracy.

Good barometers are expensive when they go under their own name, but there are excellent low-price models—disguised as aircraft altimeters—available from the surplus shops.

An altimeter is actually a barometer with a built-in calculating mechanism. It has at least two scales. One indicates altitude in feet or thousands of feet, the other atmospheric pressure in millibars or inches of mercury. Both scales are adjustable. You set either one, then take a reading on the other. To use an altimeter for weather forecasting, set the altitude pointer to the altitude of your house. A guess will do because an exact barometric reading is less important than the rate and direction of change.

Since altimeters read two different things with equal ease, you will find one handy on the instrument panel of your car. It will tell you things you never knew about the places you drive through.

To use the gauge as an altimeter, set the barometer scale according to a local weather broadcast, then watch the needle wave as you chug over hills—or even when you drive through what looks like flat country. —*E. L. Garrett, New York City.*



ALTIMETER IN YOUR CAR tells you the height of any hill you climb. Sensitive model has 20′ calibrations, will show changes of a few feet. Auto jounces won't hurt altimeters engineered to withstand constant vibrations in aircraft.

THREE SURPLUS ALTIMETERS. Simple one-pointer type (left) is not sensitive enough for home or car, but any two- or three-pointer model will work. Maximum altitude on printed scale is not important.

BAROMETER READINGS

Weather Probabilities for Barometer Readings

BAROMETER RISING

29.0 to 29.3 inches: Clearing, with high winds and cool wave.

29.3 to 29.6 inches: High winds, with cool wave, preceded by squalls.

29.6 to 29.9 inches: Fair weather, with fresh winds tonight and tomorrow.

29.9 to 30.2 inches: Fair, with brisk winds, which will diminish.

30.2 to 30.5 inches: Generally fair weather, probably cool today, with variable winds.

30.5 to 30.8 inches: Clear weather tonight and continued cool, with moderate winds.

30.8 to 31.00 inches: Southeast winds and rain.

If the barometer has not changed since the last reading, continuation of existing weather conditions may be expected.

BAROMETER FALLING

30.7 to 30.5 inches: Fair and warmer, followed by wind and rain.

30.5 to 30.2 inches: Storm brewing in the direction of the wind.

30.2 to 29.9 inches: Cloudy and warmer, followed by unsettled weather.

29.9 to 29.6 inches: Unsettled weather, increasing winds and warmer.

29.6 to 29.3 inches: Clearing, slight squalls, fair and cooler tomorrow.

29.3 to 29.0 inches: Clearing weather, with high winds, accompanied by squalls and cooler.

29.0 to 28.7 inches: Stormy weather.

The rate and intensity of a coming weather change is proportional to the rate and intensity of change in pressure.

Source: Taylor Instrument Companies, Rochester, N. Y.

FOR YOUR POPULAR SCIENCE MONTHLY INFORMATION FILE

Two-Fisted Power Package

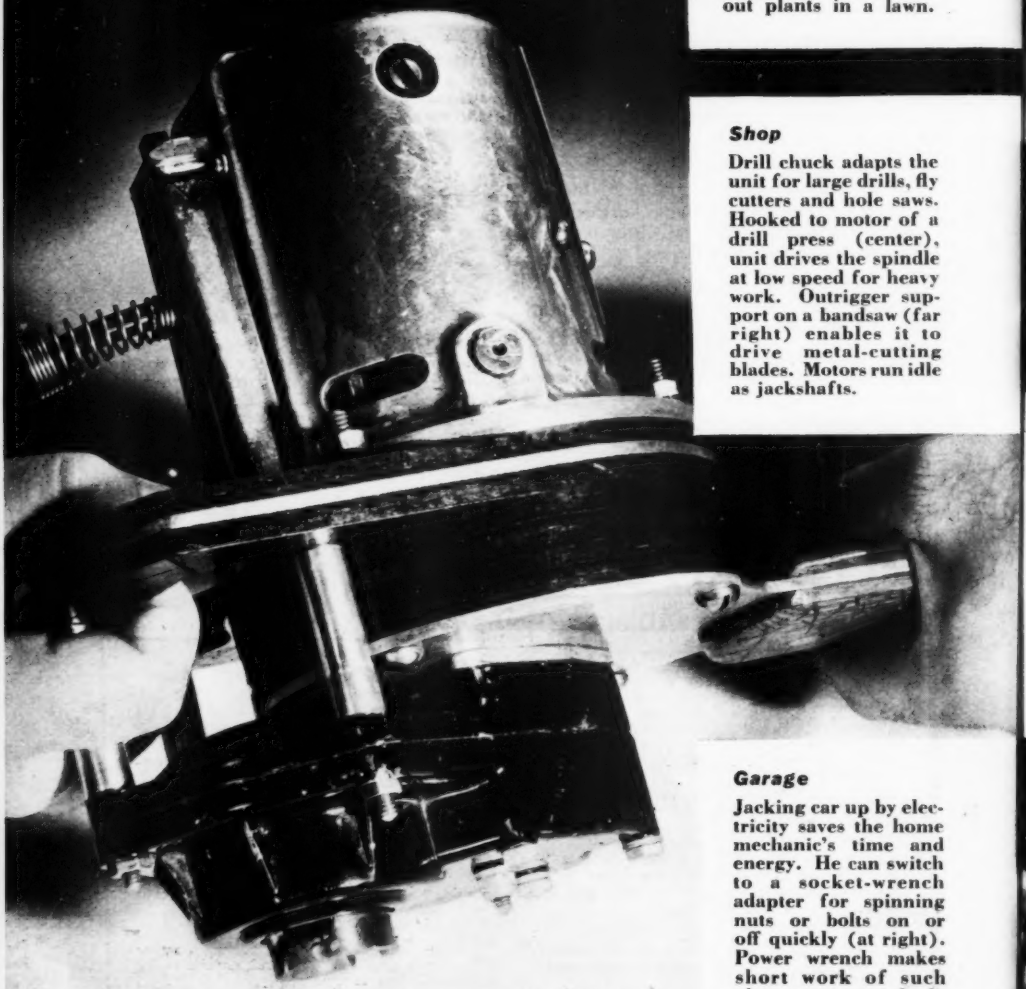
Handles the Hard Jobs

Yard and Garden

The unit drives big bits, is handy for making mortises in fence posts or drilling stumps to be burned with kerosene. Hitched to earth auger (center), it digs until auger is full (far right), and sinks a 2′ hole in sandy soil in one minute. Rig makes neat holes for setting out plants in a lawn.

Shop

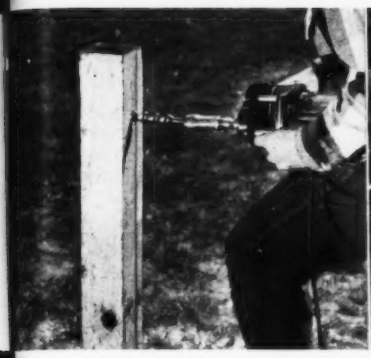
Drill chuck adapts the unit for large drills, fly cutters and hole saws. Hooked to motor of a drill press (center), unit drives the spindle at low speed for heavy work. Outrigger support on a bandsaw (far right) enables it to drive metal-cutting blades. Motors run idle as jackshafts.

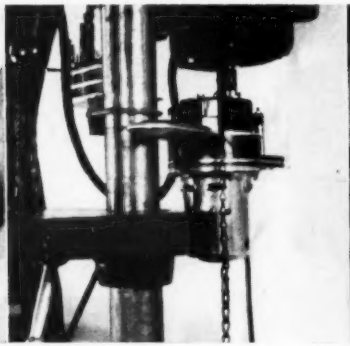
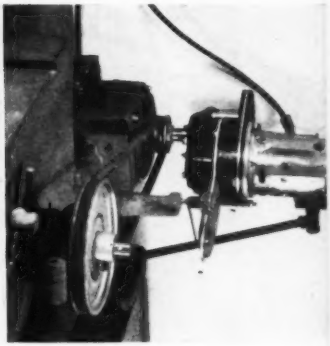


YOU CAN'T STALL this husky drive. Gears reduce the high speed of the vacuum-cleaner motor to about 180 r.p.m., multiplying torque. Slam on a load, and it just slows down a bit, keeps pulling with all the power you can hold.

Garage

Jacking car up by electricity saves the home mechanic's time and energy. He can switch to a socket-wrench adapter for spinning nuts or bolts on or off quickly (at right). Power wrench makes short work of such chores as regularly switching tires or removing cylinder head.



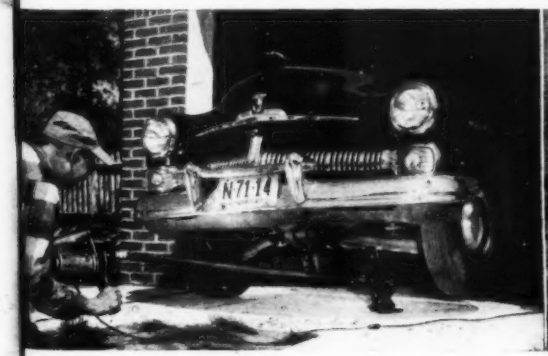



Elbow grease from an old vacuum-cleaner motor will change tires, dig post holes, drive lag screws and do many other husky jobs.

By Bradford Dittmer

EVEN a shopful of power tools won't help when the job at hand is digging a few dozen holes in the yard to plant rose bushes, or boring fence posts for rails, or spinning off nuts to pull the cylinder head in the car. That kind of work still takes old-fashioned muscle power.

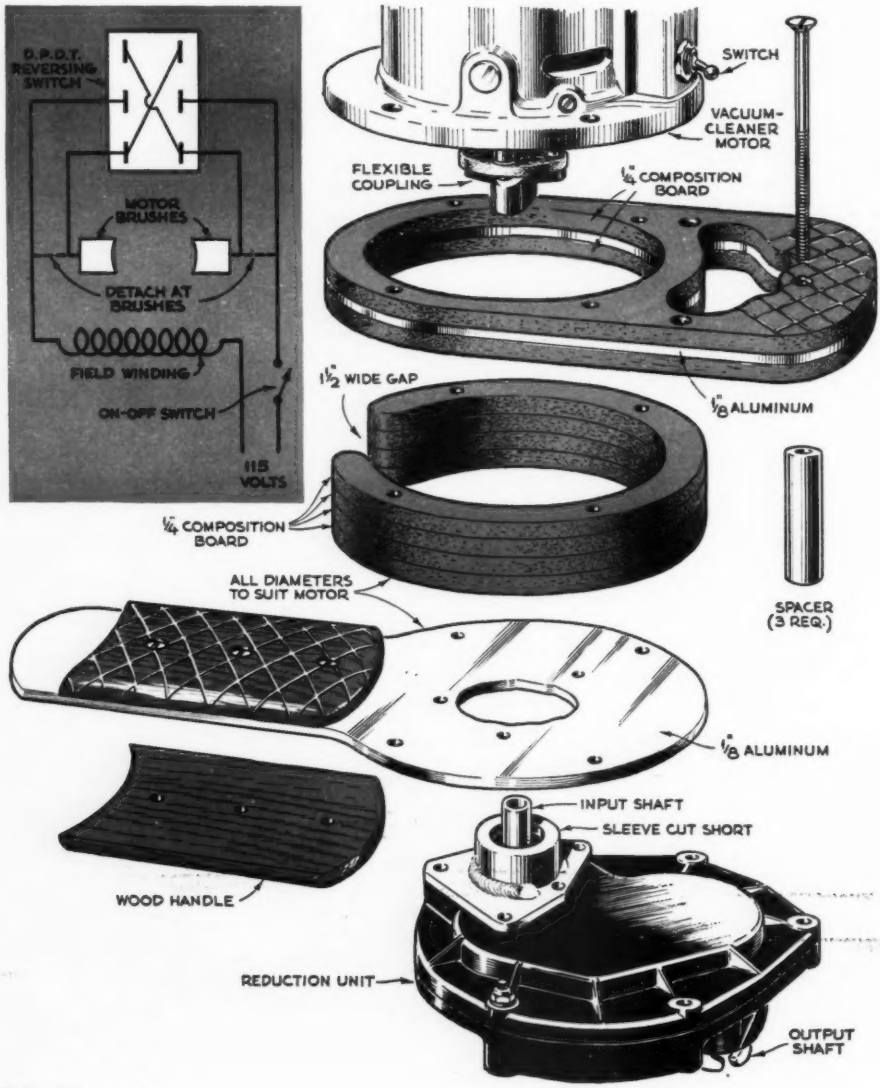
But it needn't. These jobs call for lots of

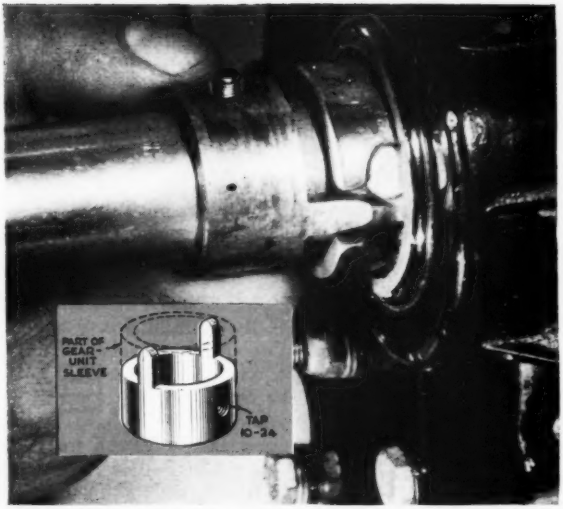


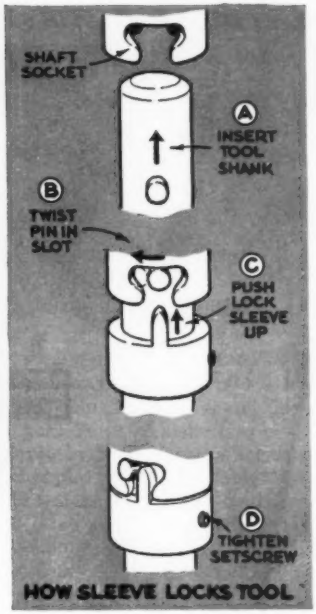
torque—twisting power—something the average electric drill hasn't got. The answer: make a tool that has high torque. It takes a vacuum-cleaner motor, a gearbox, a few odds and ends, and simple lathe work. If you have to buy everything, you'll still have change from a $10 bill.

Low speed, high power. You get a chunk of slow-turning brute strength. You can't stall it. It has all the power two hands can control, enough to operate almost any hand-crank machine—earth augers, auto jacks, hoists, ice-cream freezers. It's the answer to your longing for a boilermaker's biceps when those "little" jobs turn out to be stinkers—loosening or tightening hefty bolts and nuts, driving lag screws, making big holes, threading, reaming.

And in the shop, it lets standard power tools take on jobs that are ordinarily out of







HOW SLEEVE LOCKS TOOLS in the drive socket of the gearbox is shown above and at right. Sleeves can be made from section cut off gear unit, or from standard pipe or heavy tubing. This one is held by a setscrew. If tool or shank is threaded, a nut can be used.

their class Used as an auxiliary power source, driving through the regular motor as a jackshaft, it works oversize drills, large bits or hole saws in a drill press. Driving a bandsaw, it slices right through metal.

Parts. The gearbox I used, a Jack & Heintz No. 1045, is available in surplus stores for around $7.* It has an 85-to-1 ratio and is strong, light and compact.

Used vacuum-cleaner motors can be had from one dollar up. Try the motor out before buying it, if possible. If it sparks badly or lacks pep, better skip it. Motors from revolving-brush cleaners are usually huskier than those from straight suction machines.

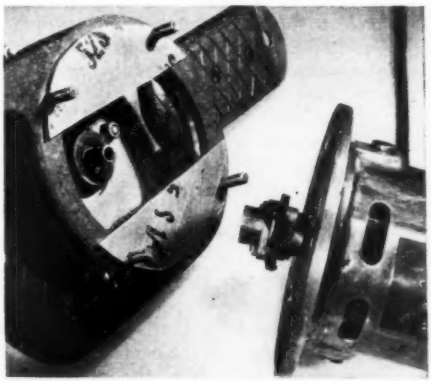
You'll need a double-pole, double-throw toggle switch and a plain on-off toggle switch. The latter might also be a midget snap switch or other momentary-contact, normally off type. With this kind, the motor would run only while you hold the switch.

Other parts required include a small flexible coupling to join the motor shaft with the gearbox input shaft, some ⅛″ aluminum plate, ¼″ hard composition board, a line cord, four ¼″ by 3½″ bolts and three 3/16″ by 3½″ bolts, and either ½″ rod or small tubing for spacers.

** I bought mine from Polley Supply Co., 6321 San Fernando Road, Glendale, Calif.*

Preparing the motor. The motor must run well in both directions. Since a vacuum cleaner runs only one way, the brushes may have worn to a feather edge that won't take kindly to reversal. New brushes will remedy this. If the commutator is badly worn or scarred, it should be skimmed clean in the lathe and the insulation undercut.

The motor shown had a terminal housing on which both switches were mounted, the



FLEXIBLE COUPLING connects motor and gearbox. Opening in far side of housing admits wrench for tightening coupling on gear shaft. Half-moon shims adjust spacing of two parts.

TOOL FOR EACH JOB. These fittings adapt the power unit to various chores, from cutting threads to tightening bolts or sawing holes. Most of them call for simple lathe work.

on-off switch right under one thumb. You may have to fit a bracket or other switch support. Be sure it is where you can reach it while holding the tool in both hands.

If the metal liners in the brush holders are exposed, they can give you a nasty shock. Rig a guard over them or coat the live parts with sealing wax.

Handles and housing. Cut off the sleeve around the ⅜″ shaft on the gear unit about ⅛″ above the bearing. Make sure that the case is filled with grease and that the small shaft turns freely by hand.

Lay out the paddle-shaped lower handle to a diameter matching that of the motor flange. Drill a ⅜″ hole in the center. Remove the three corner bolts from the unpainted plate around the input shaft, place the hole in the handle over the shaft and line up the handle. A good centerline to work to is one running from the bolt in the pointed end of the case across the output-shaft wall and through two other bolts.

Cut the irregular center hole in the handle plate and drill three bolt holes so that it can be attached squarely to the gear housing over the unpainted plate. Then mount the handle on the gear case.

Alignment. To keep the motor and case as close together as possible, cut both shafts short, leaving just enough to take the coupling. With the motor running, file down the end of its shaft until it can slip into the hollow input shaft. This will temporarily align the shafts. Put spacer blocks between the motor flange and the handle mounted on the gear case. Then use the motor-flange holes to spot the four holes in the handle.

Cut the housing layers from composition board. The housing must be deep enough to

accommodate the flexible coupling and must be open on one side so that you can reach in to tighten the coupling.

Bolt or rivet wood, plastic or composition-board grips to the long handle. The upper handle is clamped by the housing bolts. At the outer end, attach it to the gear case. Use either three bolts fitted with tubular spacers or three pieces of rod shouldered down and threaded at both ends.

Tool chucks and fittings. You can make these from ½" pipe or ⅞" bar stock. Each requires a ¼" cross pin to engage the slot in the output shaft. The driving torque will lock most tools in during operation, but those that must be positively held can be secured with a lock sleeve as shown.

Two or three such sleeves can be made from the piece that was cut off the output gear sleeve. Hacksaw and file the key projections, and tap the body for a setscrew. The lock sleeve shown for the earth-auger coupling is held by a threaded ring, which can be cut from a pipe union.

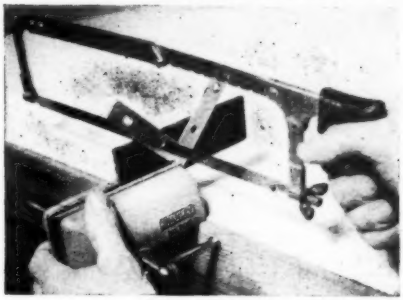
For general use, make up a few double-ended chucks in sizes from ¼" to ⅝". These are simply shanks with a drive pin, bored to fit the tools and tapped for a setscrew in each hole. A chuck from an old bit brace, fitted with a suitable shank and drive pin, will enable you to use wood bits and tapered reamers. Reamers with taper shanks will require a tapered chuck. The hollow die holder shown will quickly run a thread 3" long on rod stock, or extend bolt threads.

For the slow-speed drive of a drill press or bandsaw, a coupling should be permanently mounted on the motor shaft so that the power unit need only be slipped on. Brackets or other fittings needed to hold the unit securely in alignment should also be mounted on the machine or stand. END

Workshop Wisdom

New store teeth to bite with has Boffen.
What's hard he must dunk first to soften.
Though at drilling quite deft,
He had stupidly left
The key in the chuck once too often.

Corner Plate Makes Hangers



HEAVY hangers for suspending book or knick-knack shelves, wall desks or other husky wall-hung objects aren't always easy to find. You can make two of them in a minute by hacksawing a flat corner-reinforcing plate in half. A screw through one hole fastens the hanger to the shelf, and the other hole slips over a hook or nail driven into a wall stud.—*Darrell Huff, Sonoma, Calif.*

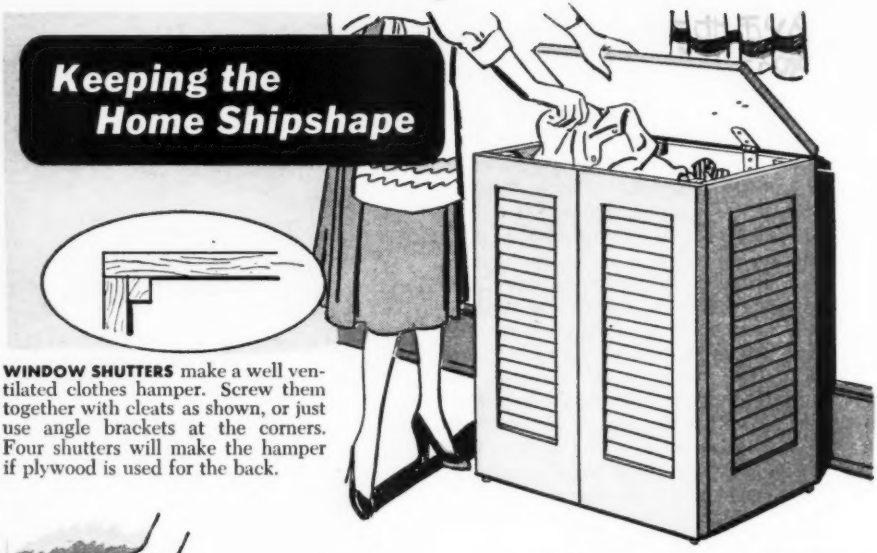
Knife Stowed Under Boat Seat

FOR quick use when fishing, I carry my knife on the underside of a boat seat. A leather sheath, tacked to the seat, does the trick. This also keeps the knife safely out of the way when not in use and prevents spray from wetting it.—*R. M. Woodbury, Ellsworth, Me.*

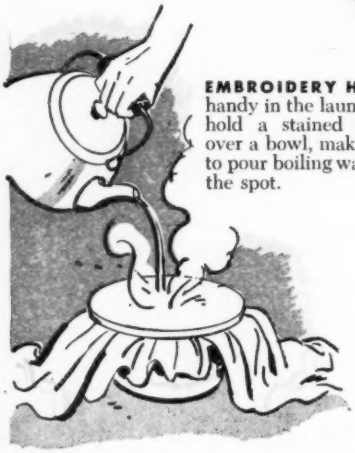
T Hinge Holds Drawer In

A DRAWER can't be pulled all the way out, accidentally, dumping the contents on the floor, when the cabinet is fitted with a T hinge like this. Screw the hinge to the frame of the cabinet so that the leaf will hang down. The hinge can be swung up for removal of the drawer.—*C. R. Hull, Costa Mesa, Calif.*

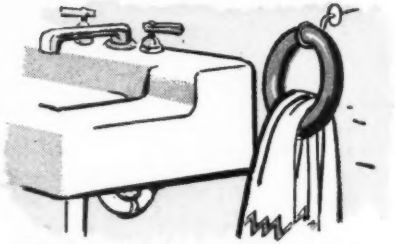
Keeping the Home Shipshape



WINDOW SHUTTERS make a well ventilated clothes hamper. Screw them together with cleats as shown, or just use angle brackets at the corners. Four shutters will make the hamper if plywood is used for the back.



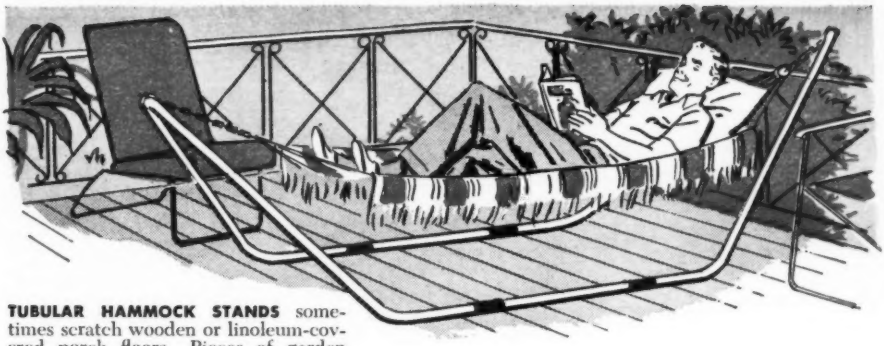
EMBROIDERY HOOPS are handy in the laundry. They'll hold a stained fabric taut over a bowl, making it easier to pour boiling water through the spot.



A PLASTIC BRACELET hung from a cup hook makes a simple towel holder for the summer cottage. Bend up the hook until it holds the bracelet securely. In a rustic room, tack up a strap-hung metal stirrup.

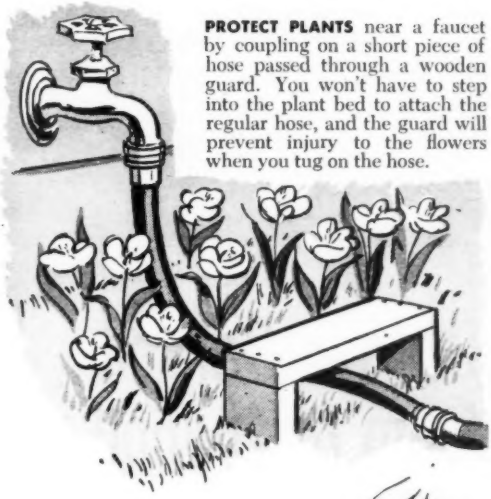
A QUICK FACE WASH for Johnny is easy on picnics or car trips if you carry a wet washcloth and a sliver of soap in a plastic sandwich box. It's just the right size for a folded cloth.

A BIKE BASKET of wire or wicker, no longer needed for hauling books and groceries, is still useful. It makes a jumbo-size mailbox with plenty of room for magazines and newspapers.



TUBULAR HAMMOCK STANDS sometimes scratch wooden or linoleum-covered porch floors. Pieces of garden hose, split and slipped over the tubes, will protect the floor surface.

LEFT-OVER PAINT with an oil base won't dry out if melted paraffin is poured over the surface. When hard, the wax seals out air.



PROTECT PLANTS near a faucet by coupling on a short piece of hose passed through a wooden guard. You won't have to step into the plant bed to attach the regular hose, and the guard will prevent injury to the flowers when you tug on the hose.

GETTING THE LAST BIT of wood filler or putty from the can is a cinch if you have a scraper like this one made from a putty knife. It is equally useful for mixing the can's contents.

THE METAL CLIP that fastens the top of the vacuum-cleaner bag won't scratch the furniture if you cover the clip with a rubber band cut from inner tubing.

Decoys Carved from Driftwood

This Texan combines beachcombing and carving to have fun at a profit.

CARVED DECOYS begin at the chopping block. Cypress can be hewed into blocks with a hatchet and rough edges removed with a plane.

I'M ONE of those lucky guys who makes money doing something he would do for fun even without pay. With me it's duck decoys.

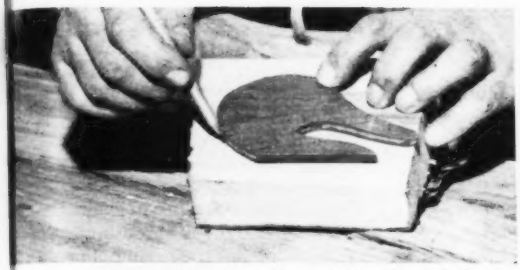
The raw material costs me nothing. I beachcomb along Galveston Bay for lightweight pieces of driftwood (cypress is best). After a few pleasant hours of carving and painting, I have wooden ducks I sell for $50 a dozen—almost all clear profit.

The pictures show what is involved. You need a few tools—hatchet, knife and plane—plus some idea of what a wild duck looks like sitting on a pond. That you can get from a library book on wildlife. You can scrounge the wood, beachcombing as I do, or pick up scraps at construction jobs. Besides cypress, white pine and spruce are good.

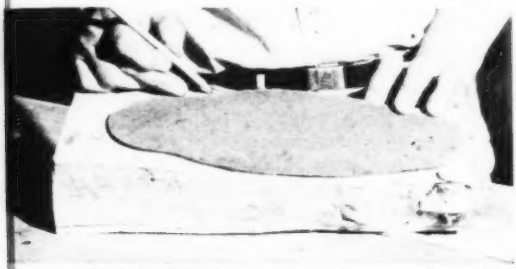
The body of a decoy requires a 15"-long piece of cross-cut wood at least 5" in diameter. For a head, a piece 1½" by 4" by 6" is large enough. Heads can be attached to bodies with six-penny nails.

Don't overdo the painting. A stool of bright, glossy decoys will scare away more ducks than it will draw. Use dull tones.

After painting, nail a thin strip of lead to the bottom of each decoy for proper balance.—*Rudy LeCompte, Baytown, Tex.*



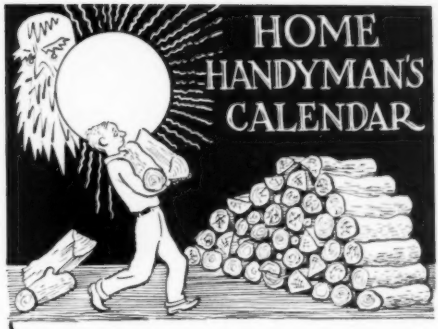
HEAD PATTERN can be cardboard or ¼" plywood. Whittling and planing head and body to shape should take little more than an hour.



BODY PATTERN, cut from heavy cardboard, is laid out on the block. Wood outside pencil line can be whittled, or trimmed with bandsaw.

TAILS AND WING TIPS are tapered and shaped with a sharp knife to bear a real likeness to mallards, pintails or canvasbacks.

SHELLAC AND A PRIMER COAT of paint will preserve driftwood models. Plumage and coloring can be copied from books on wildlife.



August For most people this is the month of humidity and heat, dog days and vacations; for the homeowner, it is time to think seriously about winter and the problems winter will bring.

Order fuel now, including firewood, and get bins and storage spaces in repair. Check your oil-burner or stoker contract. Remember, your heating plant should be completely tested and worn parts replaced every four or five years. A yearly inspection is a good way to avoid the inconvenience breakdowns cause.

Replace smoke pipes and see that all parts of your boiler and heater are airtight. Check valves on radiators, replacing defective ones. Open vents so that boiler will get air. Clean chimney flues from top to bottom. Check condition of andirons, polish brass and relacquer.

Examine windows, tightening those that otherwise would rattle in the wind. Check sash weights and replace frayed cords. Inspect all flashings, apply roofing compound, check gutters and make needed repairs. Paint and repair storm sash before cool weather comes.

How to Put in a

Kitchen Exhaust Fan

The whole house stays cooler, cleaner with a ventilator working near the stove.

AN UNVENTILATED kitchen can mess up a home as thoroughly as kids tramping in and out on a rainy day. The only difference is that the mud kids track in shows up quickly. The greasy, steamy vapors take off from the kitchen, circulate through the other rooms and condense on walls, ceilings, drapes and furniture, giving them a dingy look. The one sure way to put cooking odors where they belong—outdoors—is with a kitchen fan.

Types of ventilators. You can get kitchen exhaust fans designed for mounting in a wall, ceiling, hood, over-range cabinet, or even in place of an individual pane of glass in a colonial-style window. There are also portable ones that fit a window opening, requiring no permanent installation.

Wall ventilators—like the one shown in the photos—are the most popular. They are easy to install and can be put in any type of wall. Such ventilators are also often installed in laundry rooms, bathrooms and basement recreation rooms.

How big? Wall fans are made with 8″ 9″, 10″ and 12″ fan blades. You'll want one that will ventilate the kitchen amply but

1 LAY OUT CIRCLE for duct opening on inside wall. Make the circle ⅛″ larger than outside diameter of the fan's duct.

2 DRILL HOLES around scribed circle to simplify sawing. Use a keyhole saw to cut through plaster and the lath back of plaster.

5 CARBIDE-TIPPED masonry drill will cut holes in stucco or brick walls. Then use hammer or chisel to break masonry from center out.

6 CUT AWAY WIRE LATH back of stucco wall with wire snips. Safety goggles are good insurance when drilling or chiseling masonry.

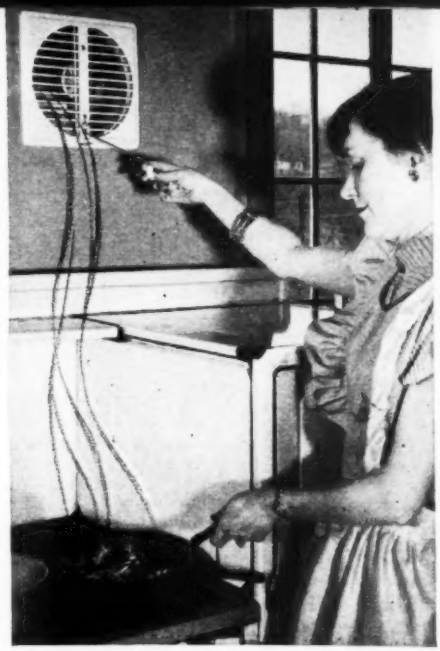
not steal heat from your home in the winter.

A fan that will move about 400 or 500 cubic feet of air per minute (9″ or 10″) is adequate for a medium-size kitchen. For a large kitchen, a 12″ fan should be used.

Where to put it. A kitchen fan can be installed in any outside wall, but it will be more efficient near the range—the chief source of cooking odors. If possible, have the air outlet (or wall cap, as it is called) on the lee side of the house, away from the prevailing winds. The efficiency of a fan is naturally reduced when it has to buck the wind.

The best spot for the fan is over the kitchen range—not closer than 18″ to the top of the stove and high enough to prevent a layer of heat from being trapped between the fan and the ceiling.

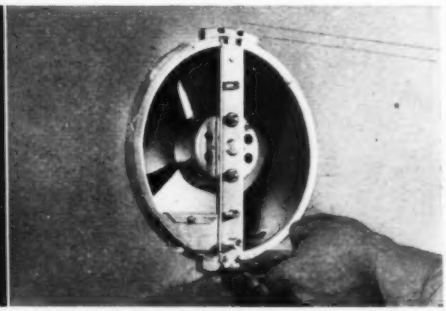
Ideally, the fan should be located where it will pull fresh air across the entire kitchen



3 SCRIBE SHEATHING, using inside sleeve of duct as pattern. Then drill hole through circle's center to locate opening on outside.

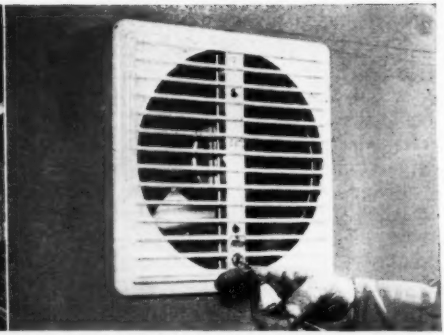
4 MARK OUTSIDE WALL with circle 1/8″ larger than outside sleeve of fan. Use hole drilled from inside as center for compass.

7 REMOVE SHEATHING by drilling holes and then cutting boards away with keyhole saw. Finish by smoothing edges of hole with a rasp.



8 MOUNT MOTOR ASSEMBLY in inside sleeve. Use wood screws through the plaster and into lath to pull sleeve snugly against wall.

9 INSTALL outer sleeve and door, level the assembly and screw it to the wall. Calk around door frame where it meets the wall.



10 TIGHTEN NUTS that join the two sleeves. Thread pull chain through grille to motor switch and finally install grille on inside.

to replace the stale air that is exhausted. Windows or a door in the wall opposite the fan will supply the fresh air.

Installation tips. Take the inside and outside sleeves apart. Handle the motor-blade assembly carefully. A bent blade or shaft will cause the fan to run noisily and wear the bearings.

Pack fireproof insulation around the sleeves between the inner and outer walls.

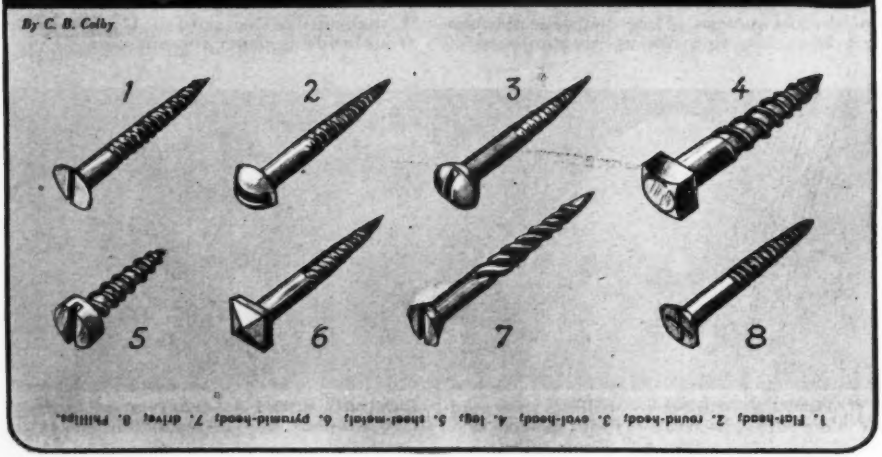
Before cutting into the wall, sound for studs and fire stops that may be in the way. Also check the plumbing to make sure there are no riser pipes at the point you want to cut through.

Wiring. Some fans operate from a wall switch, others from a pull chain at the fan. Flexible-cord plug-ins are possible, but good practice and many building codes require a BX cable hookup inside the wall. Consult your building code to find out what you need.—*Carlton G. Bucher, White Plains, N.Y.*

CIGAR-BOX QUIZ

Dig into the cigar box and try to identify these screws. Invert the page to score yourself.

By C. B. Colby



1. Flat-head; 2. round-head; 3. oval-head; 4. lag; 5. sheet-metal; 6. pyramid-head; 7. drive; 8. Phillips.

MATCHES may be protected against moisture in a jiffy on that camping trip. Travelers can cover a wet toothbrush or seal perfume or cosmetic bottles for safe packing in the luggage. Material will stretch nicely over camera lens to keep out dust and moisture.

New Film Seals Practically Anything

Made for the laboratory, this tough wonder film has countless uses in the home.

PARAFILM is a new plastic wrapper originally developed for laboratory use. Because it sticks so handily to itself or anything it's pressed against, there are also plenty of uses for it in the home and shop. It is a flexible, waterproof sheet material with excellent resistance to alcohol, common acids and alkalis. It may be folded and twisted repeatedly or drawn around sharp corners without tearing. At 180° to 200° it softens to make an excellent and completely waterproof adhesive for paper, cloth or leather. It can be bought in rolls 18″ wide and 25′ long for about $3 in laboratory supply houses.—*Ken Murray, Colon, Mich.*

AN AIRTIGHT COVER for any size of opening can be made by just drawing a piece of Parafilm over the top and pressing it down. It's fine for sealing jellies quickly (left) or covering milk bottles (center). At right it replaces the cap lost from a tube of glue.

INSULATES TOO! Wrap it around the handles of pliers and other tools for electrical work. Stretch it over the bottoms of ink and medicine bottles to make them skidproof. Cover outdoor sockets in the fall to keep out dirt and snow until spring.

FAST HOLE PATCHER. Place a piece of Parafilm between patch and garment to be mended and apply warm iron at rayon heat for 10 seconds. At right above, photographs on thin paper will adhere to sweaters or jackets in same manner. To remove photo, warm with iron.

Old Photo Rule Is Wrong

If you want life in your pictures, don't shoot with the sun behind you, says this photographer.

By H. L. Kelso

THE day I bought my first camera, a little box job, the kindly old druggist seemed to sense that I needed a few tips.

"Son," he said, showing me how to insert a roll of film, "there are just three things to remember. Always take your snaps with the sun behind you, hold your camera steady like a rock and shoot only between ten and three o'clock."

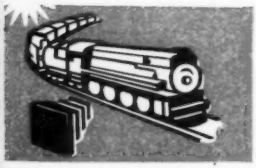
In the years since then, while I have been following my hobby of railroad photography, I have often thought what a bum steer the well-meaning old gentleman gave me. He did of course offer one good bit of advice—hold the camera steady. Probably more amateur pictures are spoiled by camera movement than all other mistakes combined.

But I have been violating his other two rules for a long time—and turning out far better pictures. So far as sun position is concerned, I usually shoot with it anywhere but behind me—to the left, to the right, directly overhead and sometimes almost straight ahead of me. I know that putting the sun behind me gives flat lighting, although there may be times when this position helps the result I am after.

And some of my best photos have been shot soon after sunup or shortly before sundown when the soft light and long shadows pack punch into the scenes. Any time of day is a good time to take pictures. All you need is enough light.

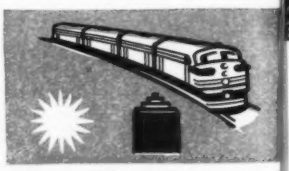
Photographers who have learned this get variety in their pictures. The fixed-angle, ten-to-three boys could do the same by forgetting their bad advice.

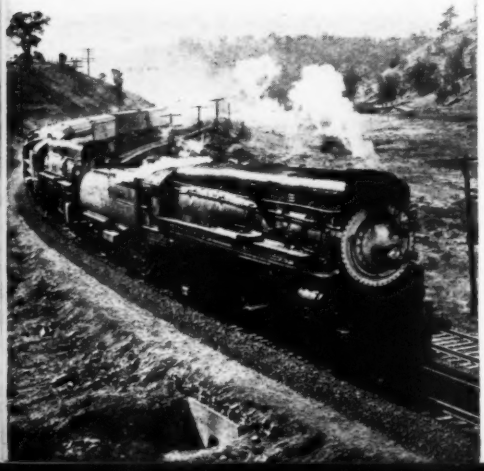
Here are four of my photos. All of them break the old druggist's rules, and I think they're pretty good.

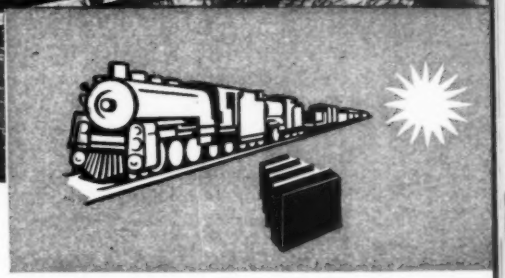


SUN IN FRONT. Shooting toward the sun is no problem at all if you shade the lens. From a high vantage point, photographer captured the highlights along top of train.

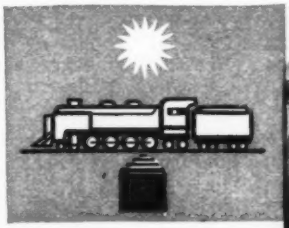
SUN TO LEFT and a bit behind. This put full light on the front of the locomotive and the side of the train. The tone of the locomotive saves the picture from complete drabness.

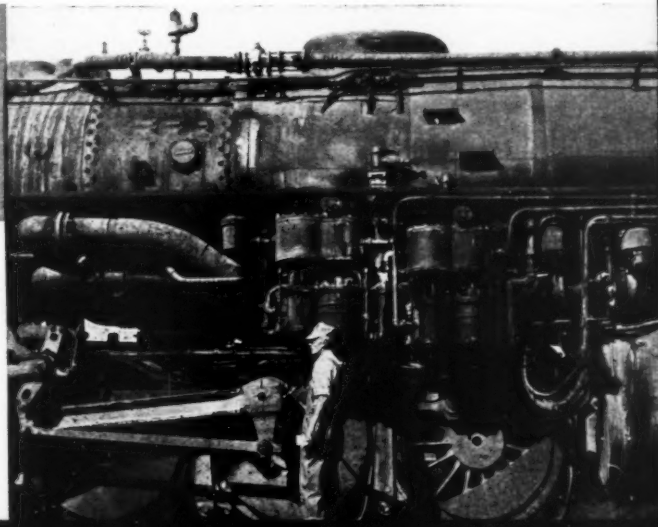






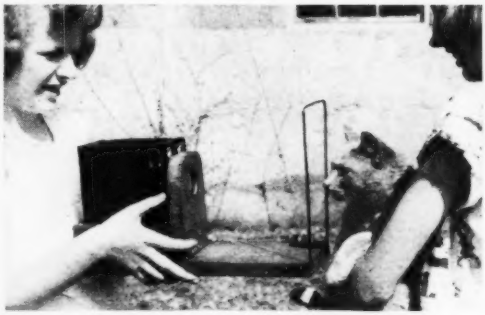
SUN TO THE RIGHT. In this desert scene shot at 6 A.M. the photographer took advantage of shadows and cross lighting for picture depth and pleasing contrasts in tones.





SUN OVERHEAD. In snapshots of people, an overhead sun often creates bad eye and nose shadows. But in this locomotive close-up the shadows add contrast to a photo that otherwise would be all one tone. END

Box Camera Shoots Big Close-Ups



POSE THE SUBJECT within the wire frame and you'll get close-ups like the cat portrait above. Big close-ups of your best friends, flowers or prize models are just as easy.

An inexpensive second lens mounted in a simple frame lets you move right up.

SUNLIGHT, a cheap box camera, and this simple homemade accessory are all you need to take close-ups that will rival those shot with costly equipment.

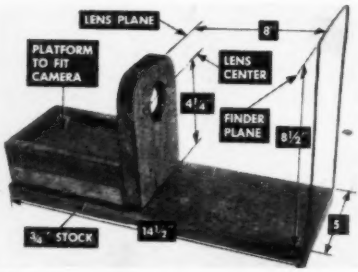
An extra lens is the only thing you'll have to buy. It should be a positive lens of about 8″ focal length, preferably about 1½″ in diameter. (One of smaller diameter may do, but you should check to see if it clips the corners of your pictures.) An optometrist or photo store can furnish the lens, or you might take one from a pair of dime-store spectacles.

For a 116 or 616 box camera, center the supplementary lens in a mounting board exactly 4¼″ above the base board. First bore a hole halfway through the mounting board with an expansion bit set to the lens diameter. Then reduce the bit diameter to finish the hole. A wire retaining ring holds the lens against this shoulder.

The camera must rest on a platform that brings its lens center also 4¼″ above the base. Make the fence around the camera a snug fit. Form a wire frame 5″ by 8½″ from coat-hanger wire and staple it to the base exactly 8″ from the supplementary lens. Be careful to get the wire finder and lens board square with the base.

If your camera is a 120 or 620 size, center the supplementary lens 3¼″ from the base, lower the camera lens to match, and reduce the wire frame to 4½″ by 6½″. Keep the 8″ distance from lens to wire finder.

Test the setup without film in the camera by securing tracing paper or ground glass in the plane where the film will be. Since the supplementary lens gives the camera a depth of field (range of sharp focus) of only 2½″, be sure to have your subjects even with the wire.—*Tom Griberg, Moline, Ill.*



LUMBER SCRAPS reduce cost. Dimensions given will suit a 116 or 616 box camera. Platform must raise camera just high enough to center its lens with supplementary one.

WIRE RING bent from coat-hanger wire retains supplementary lens in mounting board (right). A circular lens is best, but a shaped spectacle lens could be used.

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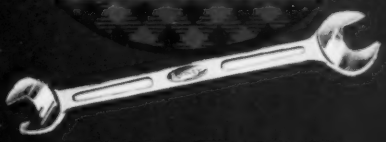
You think in terms of perfection. Your work reflects your thinking. There can be a sureness in the handling of tools that guarantees perfection. Naturally, real mechanics won't compromise on tools — only the finest are good enough.

Bonney wrenches are perfect by rigid standards. That is why mechanics call them America's finest — unmatched for lightness, strength, balance, and precision.

Bonney wrenches are the pride of the men who make them... the pride of the men who use them.

BONNEY TOOLS



Perfection in each operation results in the amazing output of America's manufacturers of cars, trucks, buses, and military equipment. Names such as Ford, Chrysler, Hudson, Packard, Nash, Studebaker, identify millions of vehicles that measure up to the master mechanic's standards.

BONNEY FORGE & TOOL WORKS Allentown, Pennsylvania

New Liquid

FLAMING ACETONE in wooden-tray top of this table burned half a minute without damage. Fire is a demonstration only. The finish will char under continued 500°–700° flame.

Forms Hard Plastic Surface

You can practically armor-plate your furniture with this finish that goes on like paint. Once it hardens, it shrugs off weather, alcohol, acids, heat and just plain hard wear.

EVER wish for a super-indestructible paint to put on your lawn furniture or the kids' playroom equipment? You can approach it with a new plastic solution that, when fully cured, hardens into an almost glass-like coating.

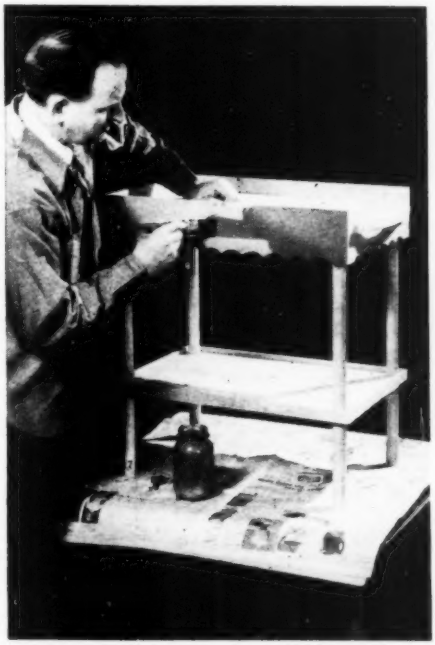
This latest plastic product, Fenolic 101, can be brushed or sprayed much the same as ordinary paint. It dries for handling in about 45 minutes. In the following 10 days thermosetting resins in it "cook" and harden due to the heating action of the acid catalyst. The finish then develops its maximum resistance to heat, chemicals, water, solvents and abrasion. The manufacturer* reports that the finish is three-fifths as hard as glass but will withstand considerable flexing. Brushes or spray equipment must be cleaned immediately after using; once the stuff hardens, there is no known solvent that will remove it.

It comes in two containers: a can of the thermosetting plastic and a small bottle of acid catalyst. The catalyst is mixed proportionately with the contents of the can—the entire bottle to the whole can, half the bottle to half the can, and so on. Mixing should be done at least six hours prior to applying the material and, once mixed, it will remain usable for five to seven days. It costs around $4 a quart, with the catalyst.

Fenolic 101 can only go on bare wood or composition board or bare metal that has been given a special primer. As with paint, the more coats the better. Each coat should be sanded before putting on the next. The colored solutions dry to a satin finish, but a final coat of clear will add a high gloss.

Being similar to resorcinol-resin glues, clear Fenolic 101 has excellent adhesive qualities. Surfaces to be joined should be given a coat of clear and allowed to set for 10 minutes. They are then coated again, joined and clamped for 24 hours. This same process is useful for applying veneers without staining them. END

Thermo-Plasti-Set, Inc., 551 Fifth Ave., New York 17, N. Y.



BRUSH IT ON or spray it just like ordinary paint. Special reducer is available for thinning to spraying consistency and for washing equipment. First coat may be sanded after three hours and second coat applied. Normal finishing schedule calls for three coats.

GARDEN FURNITURE like this tea wagon stays fresh looking with new plastic coating. The finish is impervious to weather and highly resistant to heat, alcohol and moisture. Hot pot, set directly on surface, will not mar it.

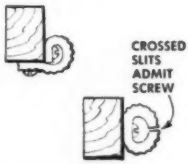
Ways to Use Old Garden Hose

Its tough, springy rubber absorbs shocks, stops skids and cushions vibrations.

Good garden hose is good for only one thing, but once it wears out or springs a leak it starts to show its real mettle.

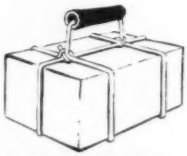
You can use scraps of hose for scores of jobs. Two ways to mount it are shown at the right. Cut or slit tubing with a knife or razor. Make holes with a hollow punch or with a beveled-tubing drill. Wet hose when you drill or cut it.—*S. Worth, Brooklyn.*

HOW TO DRILL IT

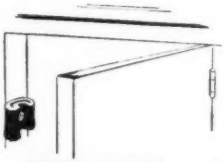


HOW TO MOUNT IT

TREE SUPPORT

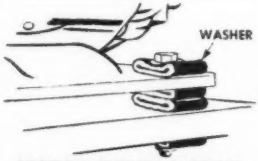


PACKAGE GRIP

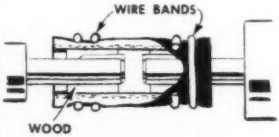


SPRING LATCH

CHISEL HOLDER



MOTOR SHOCK MOUNT



FLEXIBLE COUPLING

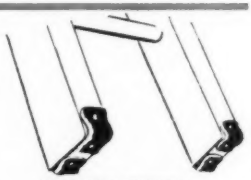
SAW-EDGE PROTECTOR

GUNWALE GUARD

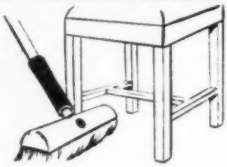
OFFSET MOP HANDLE

GARAGE BUMPER RAIL

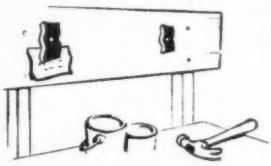
FILE HOLDER



LADDER SHOES



BROOM BUMPER



NOTE AND DRAWING CLIP

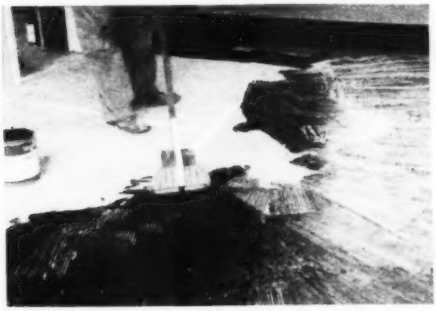
TOOL GRIPS

Extra Claw Pulls Flush Nails

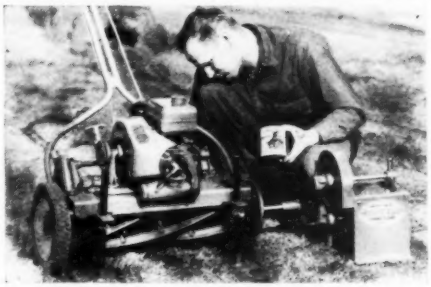
NAILS that have been driven almost flush with the work are hard to pull. The claws of a hammer usually won't grip such nailheads. But you can pull them if you file a V-shaped slot in one of the claws. Don't make the extra claw so deep that it forms dangerously sharp points.—*Will Thomas, Buffalo.*

Handle Eases Mastic Spreading

CRAWLING around on your hands and knees to spread mastic for asphalt tile is a backbreaking job. But a long handle on the spreader will let you stand as you work. Flatten two sides of the spreader's round handle. Slit a broomstick to fit over the flattened handle. Then extend a piece of wood from the broom handle to give support to the front edge of the spreader and assemble with bolts.



Lapping Machine Goes to Mower



DESIGNED for use either in a shop or on a lawn, this portable lawn-mower lapping machine can be coupled to the reel of a mower anywhere near a source of 110-volt power. The ⅓-hp. double-shaft motor has a reversing switch and the final drive arm can be adjusted to any position from 3" to 16¾" above floor level. V belts reduce the drive speed to 145 r.p.m. The Simplex weighs 45 lb.—*Fate-Root-Heath Co., Plymouth, Ohio.*

Grass Causes Engine Speed-Up

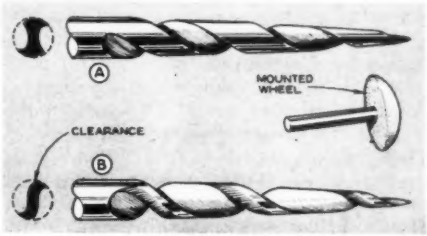
GOVERNOR-CONTROLLED gasoline engines on power lawn mowers sometimes mysteriously begin to overspeed. Before you change the governor adjustment, pull off the cooling shroud and check the fan. Bits of grass may have been sucked in and clogged the blades. With a governor that is operated by air blast, anything that obstructs the air flow will cause the engine to speed up.—*J. W. Rocke, Atkinson, Neb.*

How to Regrind a Tapered Drill for Plastic Carving

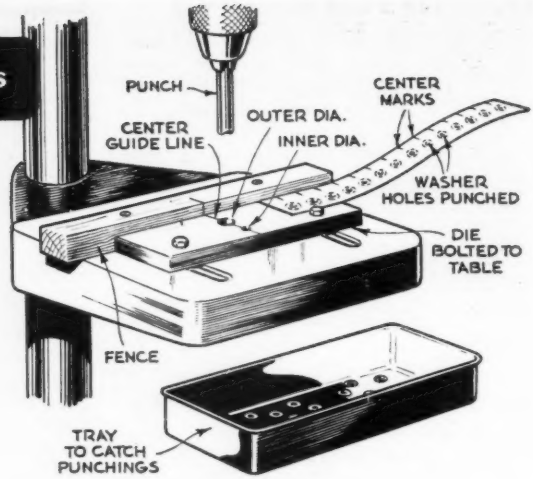
SOME tapered drills used for the internal carving of plastic tend to overheat. This melts the chips, which clog the flutes and cause more overheating.

Ordinarily, tapered drills are ground as shown in the drawing (A). With a small grinding wheel in my hand grinder, I reshape them to enlarge the flute area (B). It is also desirable to increase clearance back of the cutting edges.

The enlarged flutes evacuate chips more readily, the drill doesn't overheat and cutting edges stay sharp longer. It's a good idea to polish the flutes with a rubber-bonded abrasive wheel after grinding them.



New Shop Ideas

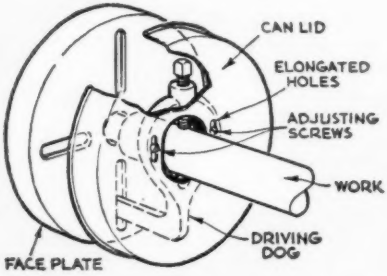


Drill-Press Punch. A simple punch-and-die setup, added to your drill press, will punch neat holes in thin material or quickly turn out insulating washers from fiber.

For washers, make two punches from drill rod, one for the washer body and one for the hole. File or grind the ends slightly concave for a shearing action.

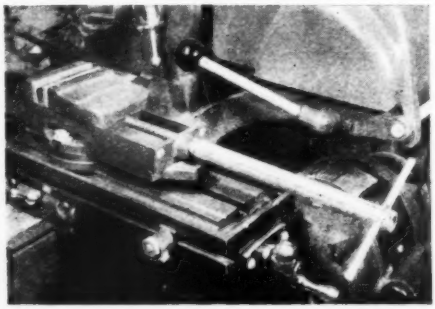
Make the matching die from a scrap block of steel, drilling two holes, each a few thousandths larger than the punch diameter. Clamp or bolt a fence to the table before drilling the die so that both holes will be the same distance from the edges.

Line up the small hole in the die directly under the punch and feed the fiber strip along the fence, matching the center marks on the strip with the spacing mark on the fence. After punching the holes, reverse the die and line up the large hole with the large punch. Again feed the strip along the fence to turn out washers with perfectly centered holes. Tray under table catches washers.—*Hugh Lineback, Stillwater, Okla.*



Lid Muzzles Dog. Filing or other operations done close to the lathe dog can be ticklish business; the whirling square-head setscrew is a constant threat to your left forearm.

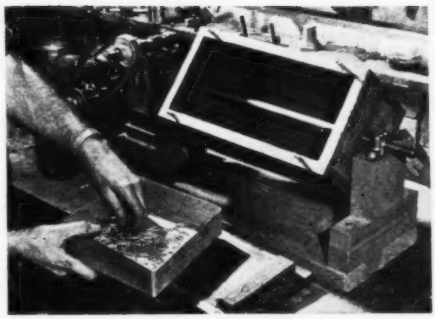
An Allen screw substituted for the square-head screw will help, but for complete safety, fit the dog with a shield made from a rolled-edge can lid. Drill and tap the dog for two screws as shown. Cut an elongated hole in the center of the lid large enough to admit the greatest diameter of work likely to be held by that dog.—*Tom Brown, Middlesex, England.*



T Wrench for Milling Vise. The crank-type handle supplied with milling vises is not very efficient when the vise is bolted parallel to the milling table. The handle must be reset after each half turn as there is not enough clearance for a full turn.

A T extension, made from a length of pipe long enough to clear the bed, can be rotated rapidly to close the jaws. The crank can be used for final tightening.

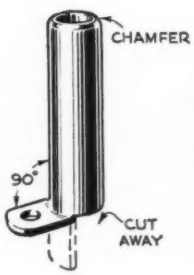
The square opening to fit the shaft is made by driving a square steel rod into the pipe and hammering the pipe to shape over it.—*Will Thomas, Buffalo.*

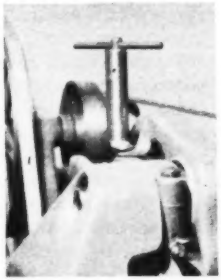


Small-Parts Tumbling Barrel. Deburring and polishing small turnings or stampings is a tedious hand operation. A tumbling barrel will do a more thorough job and save time, too.

The box shown, 8″ by 8″ by 16″, is made of ¾″ shelving board. The ½″ shaft, which runs through the length of the box to reach the supporting bearing, is driven by a worm gear from a discarded washing machine at a speed of about 250 r.p.m. A pipe flange, pinned to the shaft, is screwed to the end of the box to drive it. The cover fits on the four screws threaded into the box edges and is secured by wing nuts.

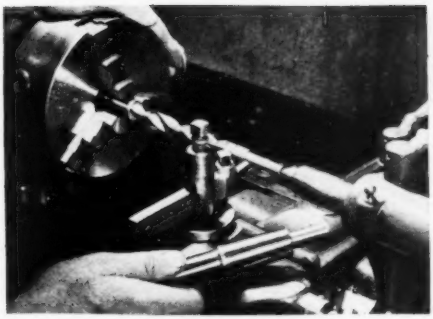
An old carborundum wheel, broken into small bits, is excellent for deburring. Steel balls will burnish the parts; coarse sawdust will polish them. Small wooden pieces may be waxed and polished by mixing them with bits of paraffin. In many cases, tumbling should be continued for three or four hours. *—Floyd McGuckin, Ridgewood, N. J.*





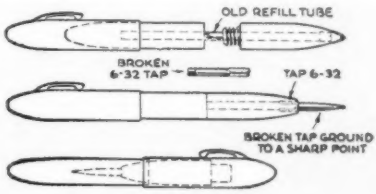
Lathe Chuck-Key Holder. Cut and bend a tab on one end of a short length of ½″ pipe and mount it on the lathe headstock to hold the chuck key conveniently.

Secure it with one of the screws that hold the gear guard; do not use a bearing cap screw.*—E. C. Lynch, Harrisonburg, Va.*



Using Bargain Taper-Shank Drills. You can get a lot of work out of bargain-priced surplus taper-shank drills if you adapt them for use in a chuck. The drill shown in the lathe has its taper completely removed; the larger one, held in the hand, has been only partly turned down, leaving a portion of the taper for optional use in the tailstock ram.

For either method the setup for turning is the same: Chuck a piece of brass rod in the headstock and, using a boring tool, bore a hole about 1″ deep in the rod to a snug fit over the flutes of the drill to be altered. The drill is then mounted on a tailstock center, using the bored brass rod to center the headstock end. As turning begins the drill bites into the brass, and the rod will then drive the drill without slipping. Take light cuts to prevent the drill from digging too deeply into the brass rod.



Old Pen Makes Neat Scriber. You won't lose your scriber or stick yourself on the point if you carry one like this.

Remove the point and the refill tube from a discarded fountain pen, and tap a 6-32 thread in the tip opening. Screw the remaining threads of a similar broken tap into the tip and grind the square end to a sharp scriber point.

When not in use, the scriber point can be inserted in the body of the pen and covered with the cap, which is clipped to the pocket. *—F. O. Glover, Altoona, Pa.*

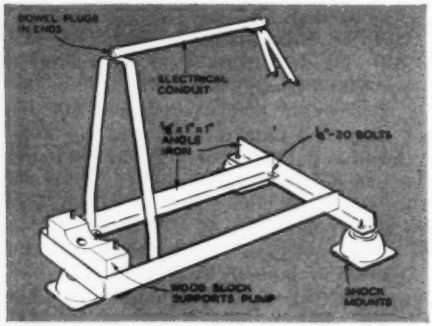
Lightweight Engine Drives Portable Water Pump

Powered bucket brigade gets water where and when you need it.

IF YOU have ever bailed out a flooded cellar by the bucketful you don't have to be told why a stand-by water pump is a handy thing to have around.

Or maybe you've tried to hose the back stretches of your garden and seen the water just dribble up to the nozzle and fall dead.

Wherever you live you often may find plenty of work for a husky little water mover. You can use it to fill—or empty—back-yard ponds or pools, spray trees or fill stock-watering tanks. You can take it to a summer camp as protection against fires, to bail boats or to give you running water.



Pumps. For all-around utility a centrifugal pump is tops. It is inexpensive, simple and trouble-free—its one moving part can't be damaged by sand or dirt in the water. It will deliver a large volume at fairly low pressure. Its main drawback—not very serious—is that it must be primed before it starts to work.

Brand new, the pump shown here cost about $7. The other parts you'll need come to no more than a couple of bucks.

Power sources. Centrifugal pumps must be run at high speed. The 3,600-r.p.m., 1-hp. gasoline engine shown, which costs around $30, works nicely. If you already have a one-lunger on a power mower or cultivator, it will serve well, though you may have to use a V-belt drive to boost shaft speed to around 3,500 r.p.m.

After you've chosen the engine, plan a frame to hold it and the pump. My frame is made of 1/8" by 1" by 1" angle iron bent and bolted as shown. I used a block of hardwood under the pump to align its shaft with the engine's.

The rig will be wet a lot of the time so a good paint job is important. Clean the frame, handle, gas tank and other non-moving parts of the engine, give them a

PUMP AND ENGINE assembled on a convenient carrying frame weigh only 24 lb. This engine, a one-cylinder, two-cycle job, delivers 1 hp. around 3,600 r.p.m. and can therefore be directly coupled to the pump.

coat of metal primer and one of enamel. The pump itself is rustproof.

Operation. Centrifugal pumps are not meant for high-pressure work. If you close the outlet pipe while the pump is running full blast, it just stops pumping. Small hose or narrow-bore couplings cut pressure and volume. On both outlet and inlet nipples use the full hose size recommended by the manufacturer.

To prime the pump, uncouple the outlet pipe on top and pour in water until the pump and suction hose are completely full. Give air bubbles time to gurgle out and then clamp the hose back on and give the engine a whirl.

You can eliminate a lot of priming by attaching a foot valve to the end of the inlet hose. This valve lets water in but not out. Once you get the pump running, the suction line will stay fully primed. You can stop and start the pump as often as you like.

Like most pumps, a centrifugal pushes water better than it pulls it. Wherever you can, place the pump near the water source and use as long an outlet hose as you need. Don't use more hose than you need on either end. Extra length just causes extra friction.—*Howard McEntee, Ridgewood, N.J.*

WOOD BLOCK raises pump so that its shaft will line up with engine's. Slot in near edge of block clears bolt on rubber foot. Strip in foreground clamps block to frame.

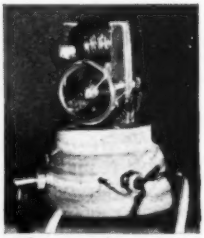
HANDLE STRAP is bolted at one end to flywheel housing. If housing does not have enough clearance for bolt heads, make the straps longer and bolt them to the frame.

ALIGN MOTOR and pump shafts carefully. Trim or shim wood block until shafts turn without binding at flexible coupling. Remove spark plug to kill engine compression.

Craftsmen in Uniform

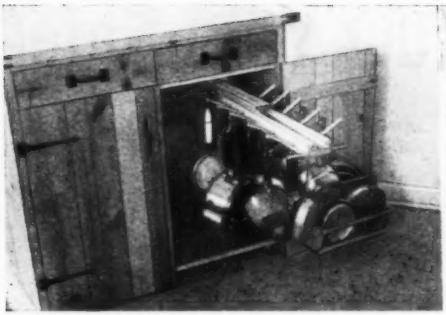
Control-Line DC-3. It took Airman Second Class Elmer Scraggs about 500 hours to make the 38"-wingspread DC-3 he is holding (left). An exact-scale control-line model built of balsa and hardwood, it is powered by two Olsen and Rice "23" engines, which are shown pulled for inspection in the photo above. The three-ounce fuel tanks fit in the nacelles behind the engines. All finishing detail is hand-lettered and painted in the colors of American Airlines. Scraggs belongs to the Sheppard Tail Twisters, model builders' club at Sheppard Air Force Base, Tex.

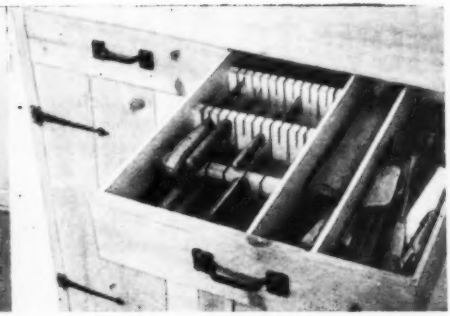
Woodcuts from Carved Blocks. Maj. Vincent I. Hack printed the handsome woodcuts in the background from wood blocks he carved himself. He learned the technique from Japanese and Korean craftsmen while in the Far East. The blocks, like the one he is shown working on, are carved from cherry, the printing portion being left in relief while the white areas of the picture are cut away. A separate block is needed for each color; as many as 30 blocks are used in one print. Now at the Armed Forces Institute of Pathology in Washington, Major Hack has carved more than 150 blocks in making 13 woodcuts.



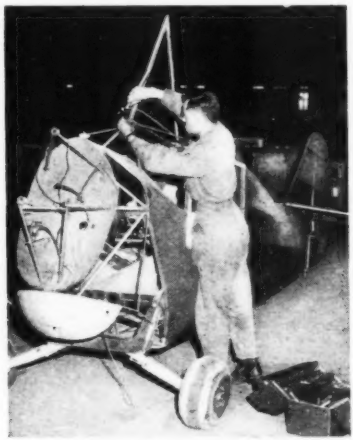
Fly-Power Motor. This electric motor is even smaller than its picture at right. Half an inch high without its base, it works on half a volt, and has a ⅛" armature. Airman First Class Edward J. Gilbertson, Duke Field, Eglin AF Base, Fla., used a wristwatch balance wheel for the tiny motor's flywheel.

Hamper Hides in Bedside Table. The table below is not only handy by a bed, but holds soiled clothing as well. Laundry goes in the swinging door at the top, weighted to stay closed, and is removed through the bottom door, held shut by a magnet. Discarded Venetian-blind slats are used in door and sides, which are slotted to let air circulate. The top is box-lumber plywood. The maker, Capt. John K. Riedel, is now stationed at the Air Force Institute of Technology, Wright-Patterson Base, Ohio.



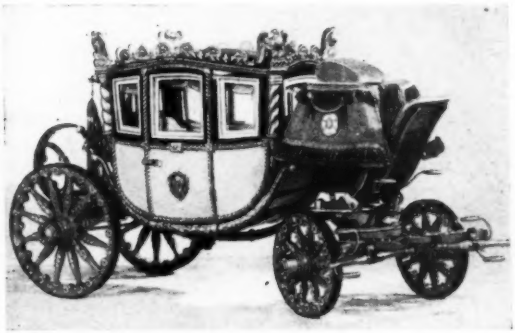


Two-Faced Cabinet. Mounted on wheels to roll to the job, this kitchen cabinet has two working sides and a 24″ by 36″ maple top that doubles as a chopping block. One end is filled with 16″ and 8″ shelves set back to back. The other compartment, shown open at left, uses the full depth for a sliding pan rack. One drawer (right above) holds a two-level knife rack. The cabinet was built of yellow pine and plywood by Maj. Kenneth H. Ducat of the Air Force, East Hartford, Conn.



Rebuilt Plane. There's nothing small scale about the hobby of Staff Sergeant E. E. Henricksen of the Air Force. As shown above, he's rebuilding an Aeronca C-3 that was picked up for $50 after it was almost completely wrecked in a hailstorm. Working in his off hours at Offutt Base, Neb., Sergeant Henricksen has replaced the woodwork in body and wings, preparatory to recovering them. A licensed pilot, the sergeant is a member of the SAC Aero Club, a number of whose members have also picked up wrecked planes and rebuilt them to flying condition.

Korean Yacht. This skiff may not be the latest in boat design, but it is giving a lot of fun to Air Force men in Korea. Staff Sergeant Robert W. Fox and a buddy built it from the lumber of an F-51 aileron crate, carved the oars, and welded the oarlocks. Sergeant Fox is now at Perrin Base, Tex.

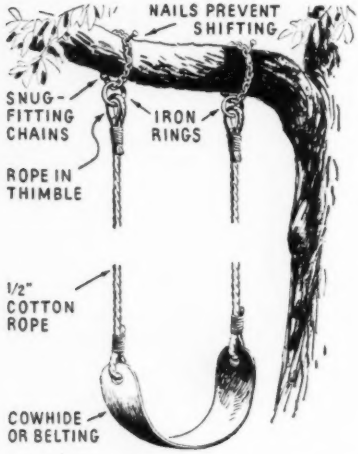


Old Boney's Coach. Fit for an Emperor of Lilliput, this intricately carved coach is derived from Napoleon's. Lt. Eugene F. Dmuchowski, U. S. Naval Air Facility, Annapolis, Md., adapted it from Fisher Body Craftsmen's Guild plans. The model is 19″ long, 10½″ high and 9″ wide. The door windows can be lowered, and folding silver steps are housed under the door. The interior is finished in white velvet and gold. The model is made of mahogany, pine, aluminum, brass and copper.

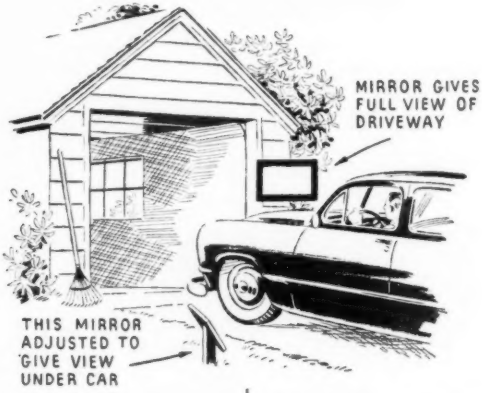
How to Make Your Yard Safer

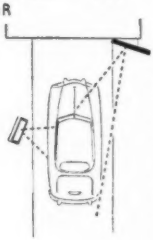
Look for danger spots before accidents happen. Your forethought can save kids and animals from their thoughtlessness.

THOSE accidents you read about in newspapers happen to *somebody*. Chances are they'll never hit you or your family—but why take chances? You can stretch the safety odds in your favor by visualizing some of the accidents that do happen all the time and then taking steps to see that they don't happen to you. Here are a few places in the back yard where foresight pays off.—*Hi Sibley, Nuevo, Calif.*



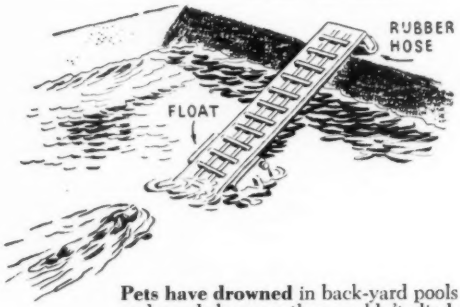
When a swing rope breaks, a child rider comes down like Humpty Dumpty, so reinforce the points where the rope gets the most wear. While you are about it, change to splinter-free cotton rope and a soft leather or canvas seat that can't hurt a child who forgets to duck or stand out of the way.





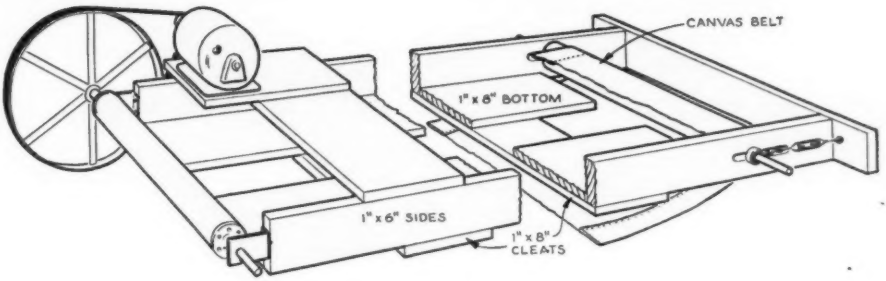
A rear-view mirror doesn't help much when you're backing out of your driveway. It can't show you an upturned rake lying in your path. Toys, dogs, even a child may be out of your line of vision. Two framed mirrors set this way cover the blind spots and are cheap and easy accident insurance.

No use telling frisky puppies or kids to be careful of fence pickets. But by using your head you may save theirs. A length of dowel screwed near the tops of the pickets makes it practically impossible for them to get their necks caught between the slats.



Pets have drowned in back-yard pools and ponds because they couldn't climb the vertical sides. A gangplank that can be slipped in when you leave the pool will serve as a stand-by lifeguard. Use a sealed can or a block of wood to float the lower end of the plank.

Homemade Conveyor Belt Excavates Basement



Cellar diggings ride this canvas railway right out to the back yard.

I USED to think conveyor belts belonged strictly in the big time, but now I know better. When I started to enlarge the doorless half-cellar under my house I found I was using most of my time and muscle toting out dirt by the bucketful.

Then I built this conveyor—mostly out of scrap parts. It took a couple of hours to make and saved me days of labor.

I built a 6″ by 17″ by 14′ wooden trough and drilled a couple of scraps of ¼″ iron plate to serve as bearings for the drive axle. The axle, turned from a 4″ by 4″ block of wood, has ½″ pipe flanges screwed to the ends to take the shafts. An 18″ drive wheel salvaged from a discarded electric pump is belted to a ¼-hp. refrigerator motor mounted on a platform above the conveyor. There may be neater ways of driving a belt but as long as I keep the shafts and bearings well greased these bits and pieces do the job.

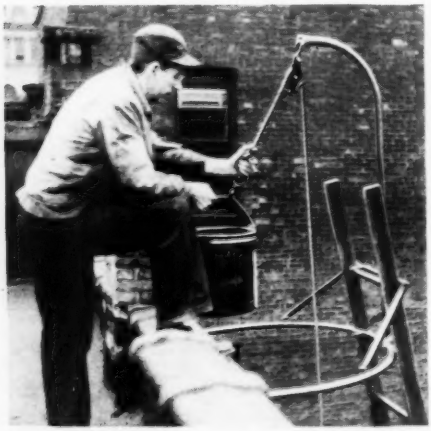
The lower roller assembly is made up of a 2″ lawn-mower roller, a pair of discarded front-wheel auto bearings, two pipe clamps and two turnbuckles. The roller shafts fit into slots in the trough sides and the turnbuckles can be adjusted to align the roller and tighten the belt.

For the belt I bought 11 yards of 20″-wide heavy canvas (the kind sold in ship-supply stores). I had the local shoemaker stitch the ends together and make a 2½″ hem along both edges to narrow the material and reinforce it.

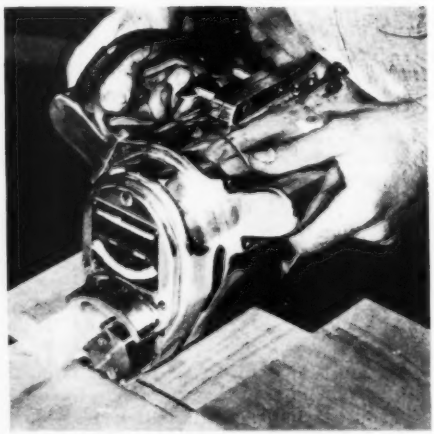
I poked the conveyor through the cellar window, propped both ends on wooden feet, and let it haul my diggings out to the back yard.—*Joseph Griscom Jr., Eastport, Md.*

New Tools

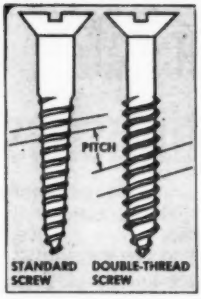
1 Plane Blades Changed Quickly. You don't have to take your plane apart to change a dull blade with this holder. Substituted for the regular plane iron, it grips a short, double-edged blade. To reverse the blade or insert a new one, you just lift up the cam and the blade drops out. Pressing down the cam locks the new blade in.



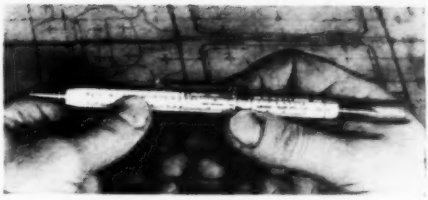
2 Hoist Fits Ladder. Any standard ladder can be quickly converted to a hoist by sliding this lightweight frame over the top of the rails and clamping four hook bolts with wing nuts. The arms—spanning 42"—hold the ladder away from walls and roof eaves and steady it against tipping.



3 High-Speed Cutter Is Portable. This tool combines a portable milling machine, planer and router. The Handshaper will cut and shape contours in wood, plastic, hardboard, paper, fabric and nonferrous metals. It is powered by a 1-hp., 115-volt, 18,000-r.p.m. universal motor.

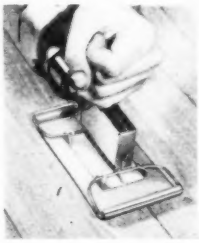


4 Screw Has Two Threads. Because this wood screw has two separate threads with twice the pitch of the standard type, it can be driven twice as fast. The new Twinfast screw has parallel instead of tapered sides, bringing more thread area in contact with the work for greater holding power. It is made of steel or brass in standard sizes with flat, round or oval heads and regular or Phillips slots.

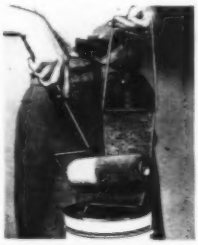


5 It's a Pencil and . . . Besides writing in two colors, this pencil serves as a slide rule and has a depth gauge marked in inches and centimeters, a detachable straightedge, an eraser and spare leads. The pocket clip is a magnifier. The Slide-Pen-Cyl is 6½" long, weighs under an ounce.

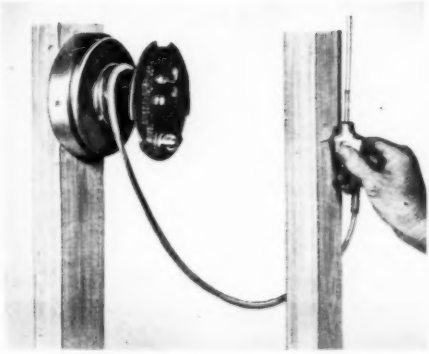
6 Sander Powered by Electric Drill. Any ¼" electric drill will drive this reciprocating sander. It has a 3" by 6" sanding surface and a ⅝" stroke and will do rough or finish sanding. End clips hold the sandpaper in place. The attachment also can be used for polishing and for rubbing finishes with pumice and oil.



7 Pad Loads Paint Roller. You don't have to fill a tray to load a paint roller if you use this absorbent pad. Just dip the pad in the paint can itself and run the roller up and down it. Hooks hold the pad securely to the can rim. The Load-A-Roller pad can be cleaned with any paint solvent for continued re-use.



8 Jacks Align Power Tools. Heavy shop machinery can be easily leveled even on sloping floors with these self-aligning screw jacks. A ball-and-socket arrangement allows the machine bed to lie level while the jacks themselves slant. The screws will lift 8,000 lb. and support as much as 40,000.



9 Water Level Turns Corners. It's a lot less work to run levels around and over obstacles with this Hydrolevel. You set the water reservoir and reel at one point, then unwind a clear-plastic tube and place it at the next point. The water in the tube seeks the same level as the reservoir.

Products on these pages can be obtained from: 1. Roy Hann, 2575 16th St., Sacramento 18, Calif.; 2. Reimann and Georger, 69 N. Division St., Buffalo 3, N. Y.; 3. Composite Die Supply Co., 14310 Birwood Ave., Detroit 4; 4. Townsend Co., New Brighton, Pa.; 5. Device Development Co., 226 W. Fourth St., NYC 14; 6. Bertram Engineering and Supply Co., 3125 Harrison St., Kansas City, Mo.; 7. King Paint Roller, Inc., 12281 Turner Ave., Detroit 4; 8. Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit 12; 9. Hydrolevel, 53 De Soto Ave., Ocean Springs, Miss.

Twin-Can Bucket Cleans Paintbrushes

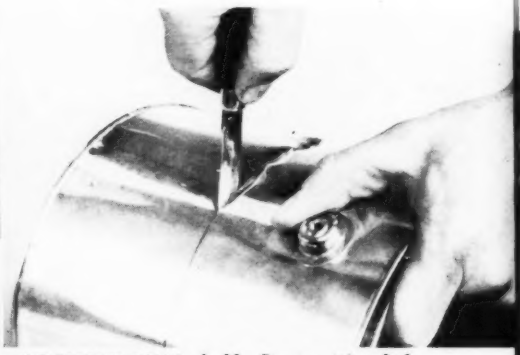
It suspends brush while lacquer thinner soaks out paint and straightens curled bristles.

YOU can put those gummed-up paintbrushes back in service and keep good ones in top condition by cleaning them properly. Lacquer thinner and this twin bucket baby your brushes—the bucket holds them upright and off the bristles while the thinner soaks out paint.

To make the tall, covered bucket, you'll need two new or well cleaned gallon paint cans, some heavy wire, solder and acid flux.

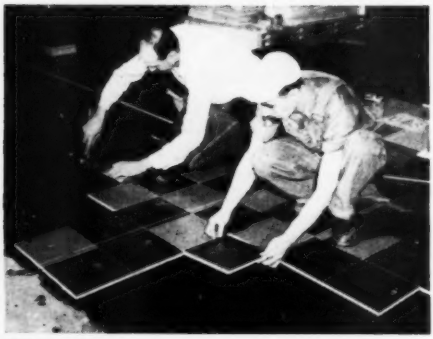
Punch four holes in the rim of one can and

WIRE HOOKS spaced around rim of first can hold brushes in the cleaning bucket. Punch holes in can rim, insert bent pieces of heavy wire and solder them in rigidly.



CUT SECOND CAN in half. Start cutting below marked line and work up to it. Use a heavy knife—not a jackknife—and trim the cut edge smooth with a pair of tin snips.

Tile Made of Paper Plastic Tested on Concrete Floors



A PAPER plastic developed for aircraft parts during World War II may find use on the ground as a floor covering in concrete-slab houses. It never needs waxing; dry buffing restores the polish.

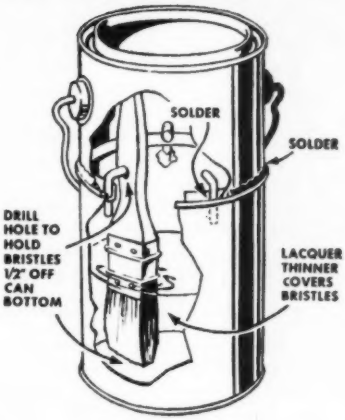
The material is made of high-strength paper impregnated with a synthetic resin. Skins of this paper 1/16″ thick are bonded to ⅜″ plywood. The 1′ square tiles are grooved on the edges to take splines that act as tongues for adjoining tiles. Early tests at the U. S. Forest Products Laboratory, Madison, Wis., indicate that the new tile has high abrasion resistance.

solder in wire hooks as shown. Cut the second can approximately in half, crimp the cut edges and solder it into the rim of the first can. Make sure the seam is liquid-tight by half filling the can with water and shaking it vigorously. Trace any leaks that show up and solder them air- and liquid-tight.

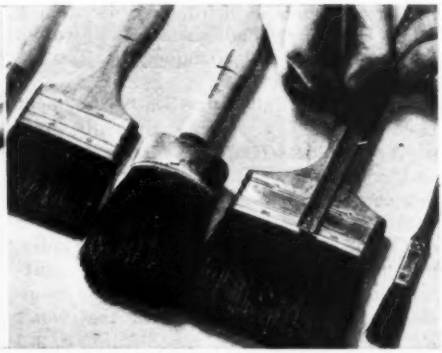
Before you put a brush in the cleaning bucket, wipe off as much paint as possible in a newspaper. Hang the brush on one of the wire hooks and let it stand for 15 minutes. Shake out the thinner and rinse the bristles in a small amount of clean thinner.

A brush that has become paint-clotted has to be soaked longer. Leave it in overnight, work out the bristles on a smooth surface and put it back in thinner for another day.

Use lacquer thinner only in well ventilated places, keep it away from fire and close the cover while brushes are soaking or when you store the cleaning unit.—*Clyde L. Allison, Cadillac, Mich.*

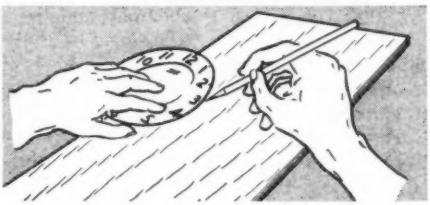


SOLDER CUT SECTION into rim of first can. Smooth rough-cut edges and crimp if necessary for good fit. Keep heat on rim and let solder flow into seam. Wash off acid flux.



MEASURE BRUSHES before drilling hanger holes. Bristles of longest brush should clear can bottom by at least ½". Drill other handles so ferrules hang at the same height.

Clock Face Measures Angles



THE face of an old alarm clock makes a handy shop protractor. Each minute division on the face represents 6°. I use a line between the six and 12 o'clock positions as the base line.—*Burns S. Hansen, Salt Lake City.*

Pipe Removes Old Nails

I RECENTLY bought a load of secondhand lumber that had a great many nails in it—most of them flattened against the wood. To straighten the nails for removal, I jammed one end of a 1" pipe over them and used the pipe as a lever to raise them enough so that I could hammer them through. —*E. A. Berg, Baldwin, N. Y.*

Why a Rolls-Royce Costs $10,000

[*Continued from page 103*]

out and drive it 90 miles an hour if you want to. You can't hurt it. Every piece of steel used in a Rolls goes through four to six separate hardening operations, and that, too, is what you get for $10,000.

The Silver Dawn does, of course, have some special features that you can't get in an American mass-produced automobile. A hand-built car should have. A factory making only 1,200 to 1,500 cars a year at prices bottomed at $10,000 can add some extras.

Ride Adjusts to Road Conditions

One of them is a ride control. You can make your rear shock absorbers—which last the life of the car—stiff or soft with the flip of a lever. Another extra is one-shot lubrication. Step on a button and grease the car everywhere instantaneously in delicately metered amounts. Packard and Stutz, among other U. S. cars, had one-shot lubrication many years ago but abandoned it. Too expensive.

Still another Rolls extra is a two-segment Hotchkiss-type propeller shaft with three universal joints. That prevents shaft whip and completely eliminates vibration from that source.

For $10,000 you get a complete car. You don't get nicked for accessories. A radio, heater, fog lamps and windshield squirt-washers are standard equipment. So is an electrically heated rear window that won't fog up.

For $10,000 you get service. The company thinks nothing of flying a man a thousand miles to straighten out some customer's beef.

Monogram a Mark of Mourning

The Rolls-Royce didn't get that way by accident. The car is a product of the stubborn pride of one man, Frederick Henry Royce, who was a fanatic on perfection. Today it has the same square radiator it has had for 50 years. The monogram at its top used to be red. When Royce died in 1933, the monogram was changed to black—a mark of permanent mourning.

Royce bequeathed a whole catalogue of ultraconservative practices to his company. Among the cars Rolls makes is the Bentley, by and large a better performer than the Rolls-Royce. One model of the Bentley can hit 120 miles an hour—and do you think you can buy one unless the company has investigated you as thoroughly as an FBI agent would and satisfied itself that you're a top-notch driver?

Rolls never has quoted a brake horsepower on its cars in the accepted American practice. The only figure issued is that for the Royal Automobile Club rating. For the Silver Dawn, that's 31.4 bhp., possibly a quarter of the brake horsepower. The figure is purely fictitious because it's arrived at by an outdated formula: $\frac{D^2N}{2.5}$. That means cylinder diameter squared and multiplied by the number of cylinders and divided by 2.5.

Three assumptions in constants have to be made in using the formula—that the mean effective cylinder pressure is 90 pounds per square inch, that the mechanical efficiency is 75 percent, and that the piston speed is 1,000 feet per minute.

Can Leave U. S. Cars in the Dust

Pressures, efficiencies and piston speeds have all gone up since the formula—known in this country as the SAE rating—was first enunciated.

Whatever the true brake horsepower, the Rolls is not a high-gear performer at less than 50 miles an hour in the American sense. Meet a hill, and you have to shift. But—let's face it—the Silver Dawn will win going away from most American cars in the 50-to-80 speed bracket. It has seat there. That's what you pay $10,000 for.

Used Models Sell Cheap—$7,500

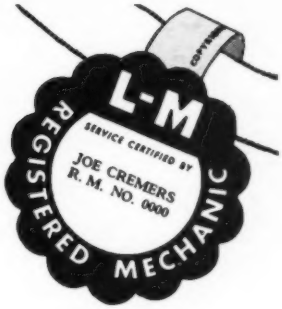
You actually don't have to pay that much to own a Rolls-Royce. A secondhand Rolls of 1949 or 1950 vintage can be had for around $7,500. You can get a 1936 Rolls Phantom Mark I for as little as $2,000 to $2,500. Along with it you may acquire a driver's seat meticulously designed by Rolls-Royce to make the man at the wheel sit ramrod-straight. Back in those days, that was to make chauffeurs look trim and smart.

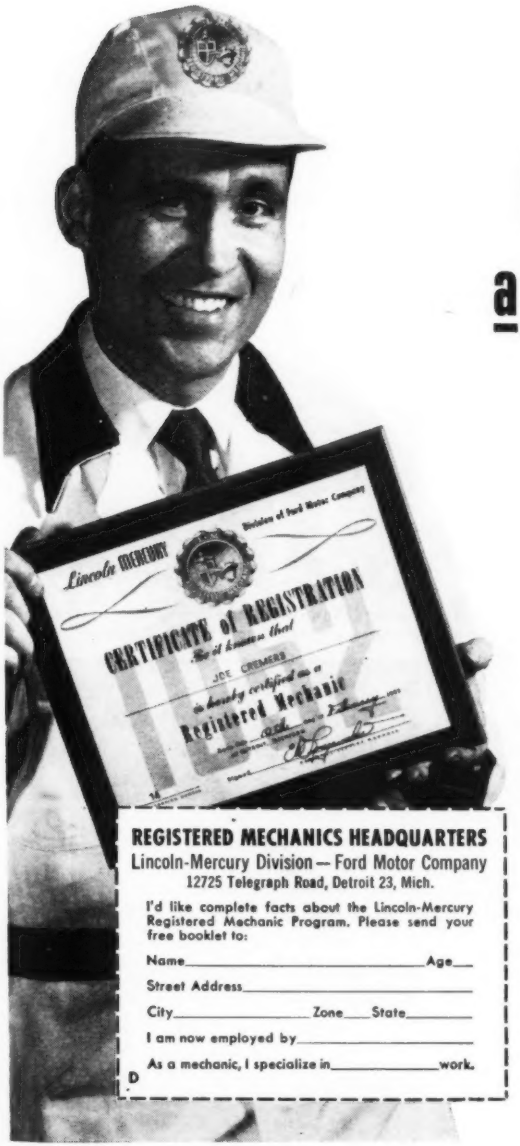
As I concluded my pleasant afternoon with the Silver Dawn and drew up before New York's swank Waldorf-Astoria hotel, the bespangled doorman gave me a double take.

"That's a Rolls-Royce, isn't it?" he asked, savoring the lines of the car.

I swelled with pride. And that, too, is included in the price of $10,000. END

As a Lincoln-Mercury Dealer *Registered Mechanic*





I'm making a name for myself!

"I DO GOOD WORK, and as a Lincoln-Mercury Dealer's Registered Mechanic, I have a real chance to make a name for myself. Every job I work on goes out with my own signed Registered Mechanic's tag attached to the car. And does good work mean something? Why, a lot of customers now come back for more—and ask for me by name.

"My standing in my community has gone 'way up because of the Registered Mechanic Certificate at my bench, and the Registered Mechanic button I wear. But best of all, I get continuous on-the-job training in latest servicing methods from factory instructors. What better preparation can a man ask for, if he intends, as I do, to make automobile servicing his field for the future?"

★ ★ ★

How about *your* future as an automotive technician? Or do you like Joe's better? It can be yours, too. And the full facts are so easy to get. Just fill out the coupon at the left, and mail it today. Our free book about the Lincoln-Mercury Dealers' Registered Mechanic Program will be mailed to your home. All inquiries, of course, are confidential.

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D

Before-and-After shots prove it...

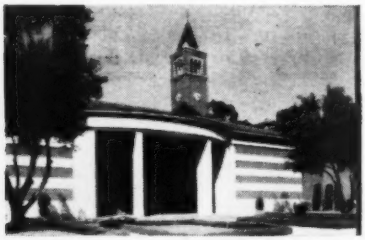
filters are "worth their weight in gold"

It's almost like magic—what a filter over your camera lens can do. If you're looking for an easy and inexpensive way to add new life and sparkle to your pictures, Kodak Wratten Filters are the answer.

The pictures on this page show just four examples of how a Kodak filter gives *punch* to an ordinary black-and-white snapshot. Your Kodak dealer will be glad to tell you about the more than one hundred varieties of Kodak Wratten Filters that are supplied for many photographic fields. Prices start at $1.65.

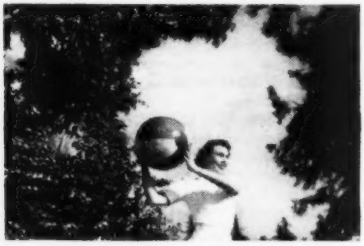
Normal photograph—This snapshot has good composition but little else. The sky is especially flat.

Taken with Yellow (K2) Filter—The picture now has life and quality. Clouds are well defined.



Normal photograph—Again this is a nice album snapshot—everything in order, but without real life.

Taken with Yellow (G) Filter—Here you see even more sky emphasis, thanks to more powerful filter.



Normal photograph—Here you need a green filter to emphasize foliage and clouds and improve skin tones.

Taken with Green (X1) Filter—See the difference? It's a simple matter to do the same for your snapshots.

Normal photograph—A "bare" lens has missed the excitement of this potentially dramatic shot.

Taken with Red (A) Filter—This filter gives you the ultimate in startlingly dramatic contrast.

Normal Close-up

With Kodak Portra Lens 1+

With Kodak Portra Lens 2+

With Kodak Portra Lens 3+

For extreme close-ups—Kodak Portra Lenses 1+, 2+, and 3+ give pronounced close-ups of subjects with both still and movie cameras. Place one in front of your camera lens to step up its power for short-range photography of people, nature studies, and table-top subjects. Kodak Portra Lenses are graduated in power, as their numbers indicate. To secure even stronger effects, the lenses may be used in combination. The pictures above show you how you can "move in" with a Kodak Portra Lens. From $2.59.

Other inexpensive lens attachments do amazing tricks too

Why stop at filters? Why not go on and discover all the new thrills awaiting you and your camera when you use other inexpensive lens attachments? Some of them are shown on this page. Others, like a Kodak Telek Lens, Diffusion Disk, or Close-up Attachment, you can see at your Kodak dealer's.

Once you get in the habit of using lens attachments, you'll never be satisfied with just a plain snapshot. That's because you'll know that so much more is possible—simply by slipping an inexpensive attachment over the lens of your camera. Try it once and you'll buy the idea right from the start.

"Warm up" your color shots with a Kodak Skylight Filter—With this filter you get warmer-tone pictures of subjects photographed in open shade and on overcast days. Use it, too, to reduce the bluish cast that often appears in distant mountain and marine scenes. And if you ever have occasion to take pictures of sunlit snow scenes, you'll find the Skylight Filter highly valuable. Prices start at $1.65.

Reproduction from normal color transparency

Reproduction from color transparency using Pola-Screen

Darken the sky in your color pictures—A Kodak Pola-Screen does the trick—in color or black-and-white. Also, it serves to subdue reflections from glass, wood, water, and other non-metallic surfaces. The effect your Pola-Screen will have on the picture may be predetermined by looking through the Kodak Pola-Screen Viewer—a miniature screen which fits over the indicator handle of your Pola-Screen. Varying degrees of sky-darkening can be obtained by rotating the screen. Price of Viewer, $6.75; Pola-Screens, from $6.75.

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Kodak

Care and Feeding of Engines

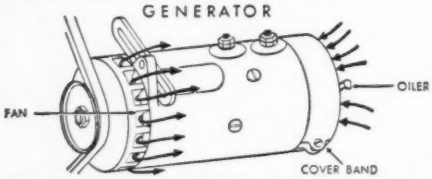
BY S. P. CORP

GENERATOR MAINTENANCE

Your generator is a busy power plant. It must keep the battery in full charge, supply ignition, and operate lights and electrical equipment. Regular lubrication, inspection, and cleaning are necessary for dependable generator performance.

LUBRICATION should consist of 3 to 5 drops of medium engine oil each time the car is lubricated. Avoid over-oiling, which is worse than lack of oil.

INSPECTION is needed every 5000 miles. Clean generator and inspect generator fan and ventilating holes. Holes should be open and free from dirt.



Air must circulate through the generator, taken in at the rear and expelled at the front. Remove cover band and check brushes and commutator; if oil-soaked and worn, replace them. Check inside of cover band for spots of solder, which would indicate generator has been running hot. If you find such spots, have complete charging circuit checked for high charging rate. If twice-a-month specific gravity readings of battery show between 1.260 and 1.280, generator is behaving perfectly.

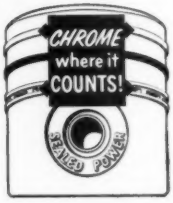
REAR WHEEL SQUEAK

If you hear a single sharp squeak as you start your car in reverse, one of the rear wheel hubs is loose. On most cars, hubs are fastened to a keyed, tapered rear axle shaft. The outer axle nut holds hub tight. A loose nut will allow hub to work on taper, wear the key and keyways, causing the squeak.

Remove hub cap, cotter pin and nut. Tighten nut to next cotter pin hole and install a new cotter pin. Failure to do this will allow hub to work on taper, key, and keyways, resulting in an impact loading which causes undue stress on all parts in the drive unit, eventually resulting in breakage.

INSTALL KROMEX RING SETS

To get maximum ring mileage under the high engine speeds, high combustion temperatures, and high compressions of late-model cars and trucks, be sure to use Sealed Power Kromex Ring Sets. They have chrome where it counts, to fight heat, friction, corrosion, abrasion. Write for your free copy of new illustrated booklet, "MORE POWER." Dept. H-8, Sealed Power Corp., Muskegon, Mich.



Gus Trails a Hot Cargo

[Continued from page 164]

rather than scare them off with a whole flock of patrol cars, we sneak in and try to get the drop on them while they're loading the second truck."

The road began to twist and dip. They were in the foothills now, and the higher mountains lay ahead.

"We'll reach the spot where they're supposed to change in about a mile. When we do, you better scrunch down in that seat! There may be some shooting."

It was weird, driving in that pale moonlight through the quiet, sleeping hills. Seconds ticked off slowly, painfully, and Gus felt his stomach roll around like someone was jabbing it with cold fingers.

Engine Quits at Wrong Time

"That was the spot back there. I'll bet those guys have gotten wise and made the switch already. I've got to get close enough to make sure."

The lights came closer, until the bulk of the truck was clearly defined in the dim light. "That's the one," Ryan said tightly. "The truck that makes the pick-up." He pulled a .38 from his holster and poked it out the window. "I'm going to take a shot at his tires." But before he could pull the trigger, the truck leaned into a sharp turn. Ryan slowed for the bend, and instantly the engine died into futile silence.

Gus Has an Inspiration

Ryan sweated as he struggled to get the engine started again. They had lost a quarter of a mile, and it took five minutes of delicate juggling through straights and turns to catch sight of the truck. Then the road suddenly hairpinned, and Ryan was forced to use the brakes. The engine died again.

Gus leaned forward in the seat, listening. Each time the brake was put on, there was the sputter of a juicy short.

Ryan swore softly and grimaced as he started up the motor again for the umpteenth time.

"Hold it a minute, Billy. Stop and let me get under the car."

"I can't stop now!"

"You'll never catch him this way. Let me look once more. I can hear something start frying every time you slow down."

Ryan pulled over, and Gus crawled under. He knew now approximately where the

[Continued on page 216]

Don't Guess About Your Future!

U.S. AIR FORCE

The Air Force needs trained Air Traffic Control Operators

The Air Force needs trained Ground Control Approach Operators

Your United States Air Force is expanding rapidly. It needs *YOU* and your special technical knowledge. Your skill and "know how" can serve your country and yourself to best advantage in today's vital job of national defense.

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Does it say "CLINK"

...or "CLUNK"?

One of the proofs of a file's basic soundness is its clear ring—"clink"—when you tap it lightly on an anvil or other hard piece of metal. A dull "clunk" is usually a sign of invisible "water cracks," poor hardening, or even inherently low-grade steel.

Nicholson employs a score of checks and tests in connection with steel examination, forging, blank smoothing, annealing, cutting, hardening and other operations in the manufacture of files. But it is the "ringing test" (as illustrated above) that leads to the final verdict under the Nicholson policy of *Twelve perfect files in every dozen.*

This company really "leans over backwards" to put into Nicholson and Black Diamond files longer sharpness, better performance, greater value than are combined in any other commonly known brand. That's why it will pay you to *ask* for them . . . and why your hardware dealer is proud to recommend them.

FREE BOOK, "*File Filosophy*"—48 interesting, illustrated pages on kinds, use and care of files. Indispensable to professional mechanics and home craftsmen. Write us for your copy.

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BLACK DIAMOND TRADE MARK

NICHOLSON FILES *FOR EVERY PURPOSE*

Gus Trails a Hot Cargo

[*Continued from page 214*]

sound was coming from—under the floorboards. His pen-sized flashlight probed the battery carrier. *Just a chance, maybe something else unrelated slapping around—but—there it was!* Happily, Gus wedged his screwdriver in and crawled out.

A Burst of Speed Closes the Gap

"Move over, Billy! You're going to need both hands to shoot on this winding road. She'll hold for awhile."

Gus poured on the speed and fought the curves with squealing tires. The engine gave no sign of quitting now.

"What was it?"

"Tell you later. Got to keep my mind on the road."

They were close to the ridge before the truck was in sight again. Gus gained gradually, until it was only a few hundred feet away. Then the truck picked up speed.

"He's spotted us, Gus. Step on it."

Gus had anticipated the move and, in one short straight, closed the gap.

"Okay, when we come out of this next bend, hold her steady."

All Over but the Shooting

They howled through the turn, and Billy leaned out the window. For one tense second the gun was poised, and then the sharp report bounced painfully against Gus's eardrums. Another shot, and a third. The truck began weaving wildly.

"There he goes!"

The truck smacked against the bank on the right side, lurched crazily on two wheels, and turned over.

Gus pulled up, and he and the policeman jumped out.

"Wait here, Gus," Ryan said. "I'll go look things over."

Less than a minute later, he was back.

"It's okay. He's cold like a cucumber. And the truck's loaded with loot. Come help me tie him up."

A few minutes later, the hijacker, a smallish, sandy-haired man in a leather jacket, was neatly trussed up in the back seat of the police car. He showed signs of regaining consciousness and appeared otherwise unhurt. Ryan and Gus got back in the front seat.

"What do we do now, Inspector?" Gus grinned, but his knees were still shaky.

[*Continued on page 218*]

Using too much oil? You need the piston rings that are *tough* on oil-pumping.

Want to stretch your engine's life? Then get the rings that are *gentle* on cylinder walls.

There's just one thing to do about worn-out piston rings and that's replace them—and the more you delay the more you'll pay.

You'll save money if you replace them with Hastings Piston Rings. They're engineered exclusively for replacement service. They *stop* oil-pumping, *check* cylinder wear, *restore* engine performance—for thousands of extra miles. It's the best money you can spend on your car.

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Gus Trails a Hot Cargo

[*Continued from page 216*]

"Well, *now's* the time I call the highway patrol. They can come and guard the furs while we take this character back to the brig."

Officer Ryan Winds Up His Case

Ryan called them on the police radio and gave them directions. Then he leaned back, lit a cigarette and smiled wearily.

"They'll be here in a few minutes. Too bad we didn't get the whole works. But one man and the loot is something. The rest'll turn up later. Now maybe you can tell me what gives with the car."

"Sure. You know those straps under your battery? Well, the front one was eaten away by battery acid. Your mechanic should have noticed it when he put the new battery in last week.

"You see, every time you hit the brake, the battery tipped forward, just a little, but enough to slam the battery cable across the metal edge of the carrier. I was in too much of a rush to notice that the bottom side of the cable had worn insulation from the rubbing. But that's where it was shorting out.

"I wedged my screwdriver in to keep it from tilting. I was beginning to lose hope of finding the trouble until I heard that sputtering noise over the sounds that the car was making.

"Anyway, come around in the morning if your mech isn't out of bed yet, and I'll fix it up. You'll need a new hold-down on the carrier—the old one's half burned away. And don't you forget to return that screwdriver!"

Gus Has His Little Joke

"Well, Gus, I sure appreciate what you've done tonight."

"You know, Billy, before you interrupted my evening, I was thinking about taking another couple of weeks' vacation . . . but I wonder. I'm beginning to think people in our town might have to go back to horses if we closed the Model Garage that long. Tell me, Billy, how would you like being a mounted cop?"

Billy Ryan made a playful swipe at Gus—then they heard the state cops' siren coming from around the bend up ahead. END

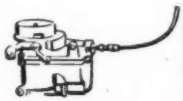
Next Month: Martin Bunn will tell you how Gus Wilson became a football hero—without leaving his Model Garage.

How To Clean Carburetors Right On The Engine

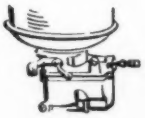
Disconnect and plug fuel line

Attach GUMOUTER tube to carburetor

Suspend GUMOUTER can above engine.



Run engine at all speeds.



Remove GUMOUTER. Reconnect fuel line. Clean up outside of carburetor.

Here's the low-down on a new approach to an old problem: the why, when, and how of cleaning carburetors on the engine.

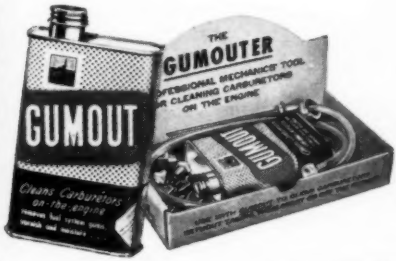
A common cause of hard to locate engine-trouble and high gas consumption is the tiny speck of dirt or the microscopic gummy film that cuts carburetor efficiency.

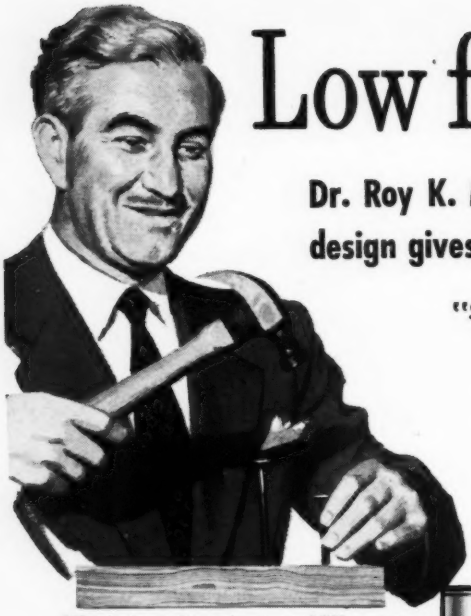
Many hours and dollars are wasted checking timing, adjusting spark plugs, replacing points—even making major replacements—in an effort to correct trouble curable only by carburetor cleaning.

Today, "clean the carburetor *first*" is considered the sensible approach to curing a rough-running engine. When should this be done? The man whose car is tuned to the sweet song of a perfectly running engine cleans the carburetor (1) at the first sign of engine trouble; (2) with every tune-up; (3) at least twice a year.

Complete carburetor cleaning no longer involves disassembly, soaking in solvent, re-assembly, and readjustment. On-the-engine carburetor cleaning does a complete job in less than 20 minutes; removes all dirt, muck, moisture, gum, and varnish. You merely disconnect the fuel line; use an inexpensive "applicator" to feed the cleaner into the carburetor; then reconnect the fuel line.

Pennsylvania Refining Company, 2687 Lisbon Road, Cleveland 4, Ohio sells the new carburetor cleaner under the name GUMOUT at $1.50 a pint. The applicator, which lasts indefinitely, sells for $4.75. The manufacturer has prepared a helpful *Carburetor Handbook,* which is sent free on request.



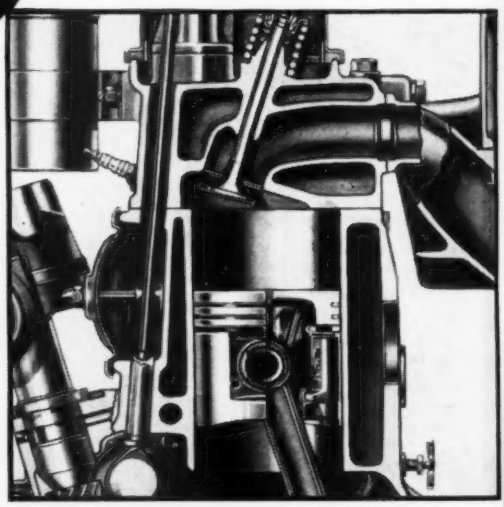


Low friction and

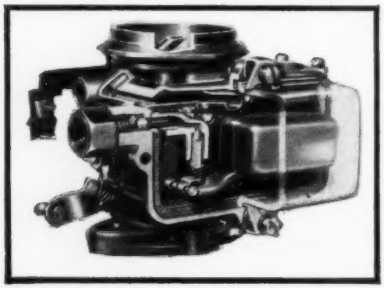
Dr. Roy K. Marshall* tells how low friction design gives you more power from less fuel.

"Suppose I drive two nails into a piece of wood, the first one inch deep, the second two inches. When I try to pull the two nails out of the wood, I find the first is almost twice as easy to pull out as the one that's hammered in two inches. That's because the first has less distance to travel and therefore less friction to overcome."

**Noted science editor, educator, and TV commentator, Dr. Marshall is nationally famous for his simplified explanations of complicated things.*



"Now the same low-friction principle has been used by Ford engineers in designing the all-new high-compression Mileage Maker Six. First they shortened the distance the pistons travel (stroke) to nearly half a mile less travel in every mile of driving, for 30% less friction and longer engine life. They designed new *free-turning overhead valves* for more even wear of both valves and valve seats and less chance of the valves sticking. *Valve guides are an integral part of the cylinder head,* not separate pressed-in pieces as in many engines. This design permits a very accurate bore and more rapid heat transfer. In fact, tests show exhaust valves run about 100° cooler."



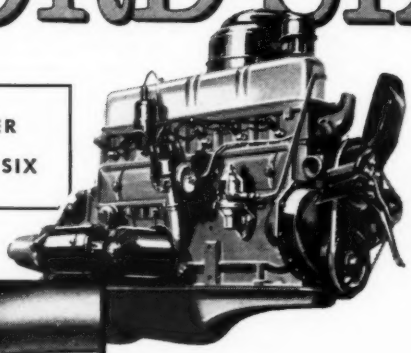
"All in all you get less friction and more usable energy . . . which adds up to more power for less money. The new Ford SIX proved this by out-saving all other Sixes in its class in the 1952 Mobilgas Economy Run.

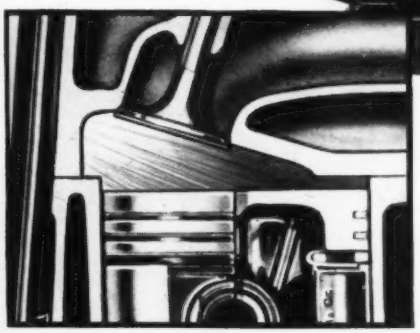
"Ford's new unit-design carburetor with compact, easily-removed metering section to simplify servicing, is part of Ford's 'easy breathing' carburetion system. The gas mixture is fed more directly into the combustion chambers through the new overhead valves."

You can pay more but you can't buy better!

the FORD SIX

101-HORSEPOWER
MILEAGE MAKER SIX





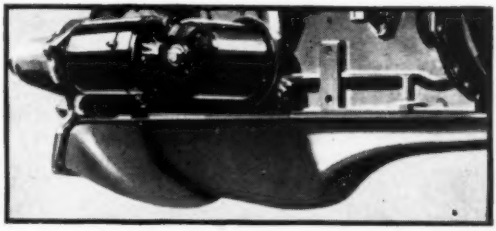
"Ford's Loadamatic Ignition, with distributor driven directly from camshaft, gives more accurate timing. And the *new Power-Contoured Combustion Chambers,* with spark plugs between intake and exhaust valves, control combustion so that the fuel burns evenly, completely.

"Ford engineers call this single control of fuel feeding, spark timing and combustion the Automatic Power Pilot . . . it gives you more 'go' with regular gas."

"Unlike most other engines, the Ford SIX *crankcase extends deep down below the crankshaft* for more support and rigidity. The flat base also permits a more effective seal between crankcase and oil pan.

"And Ford's *built-in filter* (exclusive with the Ford SIX in its field) cleans all the oil before it reaches vital bearing surfaces, eliminates the need for external or internal oil lines.

"For a real driving thrill, ask your dealer to let you 'Test Drive' the only all-new high-compression, low-friction SIX on the road."



White sidewall tires optional at extra cost. Equipment, accessories and trim subject to change without notice.

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How to Buy an Antique Car

[*Continued from page 120*]

928 copper fins, cleaning them all and putting them back again.

The Singes made their own upholstery and top, doing all the stitching with a tailor's secondhand electric sewing machine, which they bought for $10 and rebuilt.

Eight Prizes in Eight Meets

Herb has won seven first prizes and one second prize with his Olds in eight meets. There is no question but that it has a lot more eye appeal than the 1923 Model T Ford, but it is going to get lots of competition from the Model T that has just joined the Singe collection. Herb's father is the proud owner of the newcomer, a 1910 runabout that was given the dashing name Torpedo. It's as cute as a bug, even if it is tattered.

For 25 years it had been standing in a garage less than a mile away from the Singes' house, but they didn't know of its existence until a year ago. At that time the owner had an idea, common among people who have early Fords, that the Ford Co. would come along someday and offer him a new car in exchange for it. This is something the Ford Co. has never done, but the delusion dies hard.

Father Gets the Torpedo

Finally, a few weeks ago, Herb and his father dropped by one Saturday morning and persuaded the owner to part with his Torpedo for $140, a fair price, considering that the car has to be largely rebuilt. The Singes are thoroughly enjoying themselves at that task right now.

And Mom, who cried when Herb drew out his savings to buy a 47-year-old Oldsmobile—well, it's a fair bet that one of these days she'll bring home a basketful of antique Ford or Olds or Buick herself. END

Next Month: What it takes to make a Stanley Steamer look—and run—like new.

Mold Makes Cheaper Cortisone

CORTISONE is cheaper because a mold—similar to common bread mold—has been put to work to make it. The drug that provides such dramatic relief for arthritis and other diseases was previously extracted by laborious chemical processes, a fact reflected in its very high price. Now The Upjohn Co. ferments the raw material in "soup" containing Rhizopus mold. This bypasses the trickiest chemical steps to cut costs.

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Easy installation! These tiles are precision-cut—*true 90-degree squares* . . . practically fit themselves into place. Trim easily with a knife for odd-shape areas. No heating or hack-sawing needed!

Greaseproof to household fats and oils! *Won't* pit, soften, discolor or disintegrate.

Easy to look at . . . easy to walk on! It's quiet, resilient . . . not clattery or tiring. Gold Seal Linoleum Tile comes in 21 beautiful glowing colors, all in *true-square* 9" x 9" tiles. All backed by the Gold Seal money-back guarantee of satisfaction!

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Living Cells Perform on TV

By John Pfeiffer

AN "ULTRAVIOLET EYE" that looks down any microscope and shows you what it sees—magnified as much as 40,000 times—on a 10-inch television screen has been developed by RCA engineers and Dr. Arthur K. Parpart, chairman of Princeton University's Department of Biology. On the screen, students and researchers can then look at the greatest enlargement of *living* organisms ever seen.

The average laboratory microscope magnifies an object 1,200 times; the best kind magnifies 2,000 times. The ultraviolet eye, part of an eight-pound TV camera that fits over the eyepiece of a microscope, enlarges the microscope's view about 20 more times.

Dr. Parpart let me see one at the Marine Biological Laboratory in Woods Hole, Mass. When he focused the TV image, I watched living cells as large as grapefruit float across the screen, with creatures the size of marbles darting among them. The small organisms were bacteria. The large ones were sea urchins' eggs, used for research on human fertility, cancer and similar subjects. The eggs I saw had a solid, three-dimensional look, because of the contrast and detail the ultraviolet eye provides.

GETTING READY FOR A SHOW starring creatures that are invisible without a microscope. Dr. Parpart sets up his counter-top TV studio.

ONE AMOEBA MEETS ANOTHER in drama never before shown on any TV screen. Scale is enlarged view of one in the microscope.

TV Microscope "Slices" Egg

Dr. Parpart next showed me the curving outer surface of a single egg. Then he turned the focusing dial. There was a brief blur and a clear new image appeared. This time I was looking directly into the microstructure of an underlying layer. We probed deeper and deeper into the egg until the television microscope had reached its center. It had, in effect, sliced the egg into sections about 1/14,000 of an inch thick.

The secret of the ultraviolet eye is the Vidicon (PSM, May '50, p. 119), an electronic tube five inches long and an inch in diameter. Ultraviolet rays, passing up from the bottom of the microscope and through the eyepiece, fall on a target in the tube. The target, about the size of a dime, is coated with a mixture of materials (it's a chemical composition and a trade secret) that carries a positive charge of one or two volts. Light from the image causes enough negative electrons to be deposited on the target surface to neutralize the accumulated charge. A scanning beam from a tiny electron gun at the other end of the tube passes back and forth across the target 1,800 times a minute. The beam detects the neutralized spots and, as it does so, generates television signals, which vary with the light and shade of the original image and reproduce it on the screen.

Dr. Parpart is already using the television microscope to examine red and white blood cells, plant tissues and amoebas. Medical researchers are studying the growth of malignant tumors with it. There is talk of providing it with an infrared eye, and even of using it with color television.

Around the clock usefulness...

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Made only by CHAMPION DEARMENT!

No matter what the job—plumbing, electrical, automotive or whatever, Channellock pliers are handy to have around. The patented Channellock principle permits a wide range of size adjustments without decreasing gripping power or leverage.

Channellock pliers are made by Champion DeArment—for nearly 3/4 of a century manufacturers of highest quality tools.

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And remember—Only Champion DeArment makes Channellock.

Send for Catalog D14 today.

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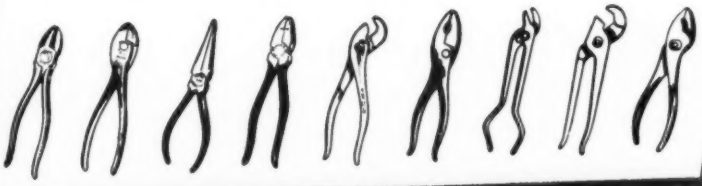

Channellock pliers are listed in the Yellow Pages of most Telephone Directories under "Tools"

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Line Forms Here for Trip to Moon

[*Continued from page 84*]

Earth. And walking will be made even more difficult because the Lunar surface is covered with two to three feet of pumice-like dust.

The stay on the Moon will be one Lunar day (two weeks' Earth time). Arrival will be at dawn and departure at sunset, since temperatures will drop to minus 459° when the sun sets. Midday might be too hot without refrigerated suits—the temperature soars above the boiling point. But stepping into any shadow will be a quick way of cooling off.

Heads Up!

Since the Moon has no atmosphere, the tourist will see the sun and stars all at one time in a completely black sky. There'll be no clouds, storms or rain to interfere with sightseeing. But a bombardment of meteors will be a definite hazard. A meteor from out of space becomes visible only when it enters an atmosphere. And as the Moon has no atmosphere there might not be time to duck for cover.

Even this probably wouldn't discourage the woman applicant for a Moon tour who thinks it would be wonderful. She has failed at everything she has tried on earth, she wrote, and says, "I figure it would be a one-way trip but there's really nothing to lose."

Mars the Favorite Planet

Among the planets Mars is by far the favorite. Although 145 times farther away than the Moon, it is a logical second choice for a space voyage. It is the only planet on the surface of which (with the aid of a telescope) we can make out definite physical features. Large patches, which change color with the Martian seasons, are believed to be vegetation resembling lichens found on Earth. It is the only evidence we have that any of the planets might be inhabited. That may or may not be an attraction. As one applicant asked, "If there is life on other planets, how will we defend ourselves?"

Mars is definitely a summer space resort, with noon temperature about 80°. The winters are extremely cold.

Water would have to be taken along to both the Moon and Mars, as it isn't found there in liquid form. But, for what it is worth, you could take your watch along to Mars as its days are just about the length of an Earth day. But leave your calendar

[*Continued on page 228*]

MICROSCOPE LIGHT $7.95 Ppd.

Professional model, Universal joint connects chrome and barrel-type bakelite head to solid, heavy base. Chromed fittings. May be used clear or with two special glass filters, blue and green. Complete with bulb, cord, two filters at no extra charge.

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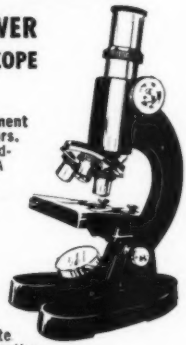
100 200 300 POWER Triple Turret MICROSCOPE $14.95 Ppd.



Laboratory Model — The instrument that amazed biology instructors. Excellent optical qualities, adjustment, solid construction. A lifetime bargain for students, schools, labs, amateur researchers. **Anyone can now own one!** (Performance cannot be duplicated for $75.) Uses: animal, plant and mineral research Study plant cells, microscopic animal life, crystal structure. See the complex anatomy of tiny insects, larvae, eggs. An absolute necessity in hundreds of fascinating fields. Shipped in hardwood cabinet.

40 TO 600 POWER

15 Combinations! Professional

MICROSCOPE $29.95 Ppd.

Model #635

At last! The FIRST instrument with this range of performance ever offered under $125. Every feature needed for advanced university, pre-med and medical school use. Triple revolving turret containing 10X, 20X and 40X achromatic objective lenses. Achromatic condenser, 6-aperture revolving iris. Two-side plano and concave substage mirrors. Solid base, excellent precision construction. Complete with fitted hardwood case. With 15X eyepiece (giving 150X, 300X & 600X) less mechanical stage.

SET OF EXTRA EYEPIECES $9.95 Ppd.

For above model #635 microscope. 4X, 5X, 8X, 12X interchangeable eyepieces in hardwood case, giving a total in all of 15 different powers from 40X to 600X. Complete set of 4 in case

MODEL #400 MECHANICAL STAGE $14.95 Ppd.

Shown on model #635 microscope. Made only for this instrument. This is an optional accessory which allows you to move the slide microscopically right, left, up or down without touching slide. This calibrated stage cannot be duplicated for less than $45. (If microscope is ordered without mechanical stage, we will fit your instrument with fine spring steel, clip-type slide holders.) Shipped in fitted hardwood case.

NAVY TYPE MARK XX

20 POWER TELESCOPE $9.95 Ppd.

$30 value. Fine optically ground achromatic lenses, fully coated. Same power as standard artillery observers spotting scope. Precision all metal construction. Rust and salt spray resistant A valuable ship and boat owner's possession at a price everyone can afford Excellent scope for rifle range or hunting. Shipped in choice of pigskin case or hardwood cabinet.

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SURFACE MICROSCOPE $26.95 Ppd.

Model #630 — 4 eyepieces included: 5X, 10X, 20X, 30X. A beautiful finely made instrument for inspection of GEMS, CRYSTALS, ORES, MINERALS, METAL SURFACES, MACHINED PARTS, FABRICS, STAMPS, COINS, BIOLOGY SPECIMENS (dissecting), ENGRAVINGS. For WATCH and INSTRUMENT REPAIR. Plenty of room beneath lens for fine work of all kinds. Swivel head allows allover inspection without moving object. Micro-focus adjustment at rear. Complete with removable hand rests, hardwood case and interchangeable eyepieces. Two sided mirror: clear and milk side for anti-reflection. A $100 value.

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DAVENPORT, IOWA

Line Forms Here for Trip to Moon

[*Continued from page 226*]

behind. On Mars a year is 687 days long.

Mercury would not interest pleasure seekers long. The side facing the sun has a temperature that would melt lead; the other side gets down near absolute zero—minus 459° F.

Venus would be the complete surprise-package tour. Not even the most powerful telescope has been able to penetrate its perpetual layers of yellowish clouds. What conditions are below is anybody's guess.

Saturn and Jupiter are known as the "forbidden planets." Their atmospheres are composed of methane and ammonia gases, unfit for earth dwellers to breathe.

But then, if conditions on the planets were like those on Earth, where would be the adventure of space travel?

They Mean It

Are they serious, these applicants for space flight? A thumbing through of hundreds of the requests indicates that a great many are. Certainly so is the 16-year-old student who was afraid his application might be too late as rocket-ship space would be limited. But he asked that his request be given priority for two reasons:

- A majority of the applicants are probably older and may not be alive when a successful space ship is ready.
- Thousands will back out if a ship is ready within their lifetime.

One man with a reservation did cancel it: "Due to certain things that have happened, I will not be able to go on your space flight. I am sorry."

A woman, after making her interplanetary-flight reservation, wrote to Lloyd's of London requesting insurance rates—not for herself but against loss in case the atmosphere of Mars ruined her valuable jewelry.

One Way: $48,000,000

In the belief that we should make a good impression on any planetary residents, an Australian actress, who made her reservation more than a year ago, recently wrote from Paris that "I am seeking a famous French couturier to design a special space wardrobe for my forthcoming interplanetary tour."

A look-before-you-leap applicant is the man who wants the answers to some questions before he signs up for interplanetary

[*Continued on page 230*]

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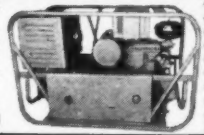

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This General Motors-Allison Centrifugal Pump—designed for use on U.S. Air Force Mustang Fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2½" standard pipe thread, twin outlets with 1¼" pipe thread, ball bearing supported ¾" shaft. Easy, fast simple priming. Rotation, counterclockwise facing shaft. Shipping wt. 35 lbs. Gov't acq. cost $145.00. F.O.B. Chicago. NOW ONLY..... **39.50**

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Item #126

ITEM #160—PESCO GEAR TYPE HYDRAULIC PUMP—Compact—Powerful—Reliable. Especially designed for belt drive from fan belt, power take-off, drive pulley, electric motor or small gas engine. Equally suitable for direct coupling. Pedestal type mounting with two bolt holes for ⅜" hold-down bolts. Standard ½" pipe thread inlet and outlet ports. Delivers 4.5 GPM at 1000 PSI at 2800 RPM with 3 HP. Will actuate one Item #6, 3" bore, 24" stroke cylinder in 10 seconds. Hardened steel gears turn in dense oilite bronze bearings. Rotation—clockwise facing shaft. Guaranteed trouble-free service. Ship. wt. 6 lbs. F.O.B. Chicago **22.50**

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ITEM #126—Four-way, open center control valve with built in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type, smooth, positive, easy operation, can be used as single unit or mounted in series of any combinations desired. Has ¾" pipe thread inlet and outlet, ½" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8¼ lbs. An outstanding Buy! F.O.B. Chicago..... **21.50**

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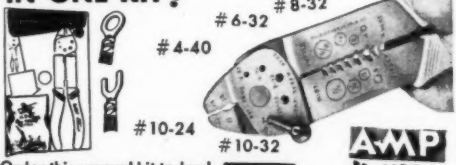

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Works like a Fountain Pen

Stripes with Paint instead of Ink!

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BOWES "SEAL FAST" CORPORATION
INDIANAPOLIS 7, INDIANA

Line Forms Here for Trip to Moon

[*Continued from page 228*]

flight: "How much is it going to cost? What is the proposed means of propulsion—magnetic energy or jets?"

The Planetarium can't, of course, answer the cost question, except that at current airline rates a one-way trip to the Moon would cost around $15,000 and to Saturn about $48,000,000.

Some applicants are choosy, like the man who wants a planet flight, but insists on a reservation to Mars because he understands "It is not as cold there as on Jupiter."

The prize ulterior-motive applicant is a third-year high-school student. "On a trip to the Moon or one of the planets I could learn more than in my school career combined with everyday life. Should I pack a box lunch?"

One candidate for flight to Saturn (790,000,000 miles) regretted that he couldn't come to New York City to make his reservation in person. He lives too far away—200 miles upstate.

Expert Help Available

All applications aren't from passengers who want to go along just for the ride. Many technicians, pilots, engineers, have offered their services and advice. From Argentina came this appeal:

"I do not have enough money to be one of your 1st Class passengers. But I might do some service during the space voyage. I speak many languages, know bookkeeping and am good at photography, drawing, painting, first aid, general business and office administration. I'd be content to be the cook or even to sweep out the floor of the rocket kitchen."

Another: "Do you think my knowledge of cybernetics [the science of communications and control] would help in any way?"

The attitude of the majority of applicants is summed up by the following note appended to a reservation blank: "This chance to put our names on file for future space flight gives me the feeling that interplanetary travel is just over the horizon."

Maybe it is. END

Avoiding Flashbulb Duds

WHILE taking flash photos, you can lessen the chance of a misfire by rubbing the base contact of each bulb against a strip of sandpaper cemented to your camera.—*Roland Nagy, Clifton, N. J.*

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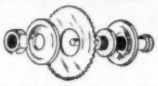
SET 25D 15 Different Size High Speed Morse Taper Shank Chucking Reamers up to 1/2" with No. 1 and 2 tapers. New and used. Priced at only..... **$7.95**

SET 13D 8 Different Size High Speed Morse Taper Shank Chucking Reamers from 1/4" to 1". New and used. Priced at only **$7.95**

6 SLITTING SAWS WITH MANDREL

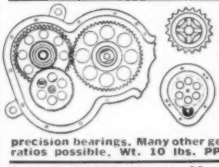


SET 34D 6 Different Size High Speed Slitting Saws, 5 pcs. 2 3/4" dia. x 1" arbor, plus 1 pc. 5" dia. x 1/2" arbor—thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in 1/4" or 1/2" elec. drill. $25 value. PPD. Only..... **$4.95**

7 selected, sharp H. S. Slitting Saws as above to use on your own mandrel or milling machine. New and used. PPD. A bargain at..... **$4.95**

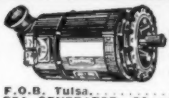
NEW MOUNTED STONES

SET 27D Mixture of 12 Mounted Stones with 1/4" shanks. PPD... **$2.49**



New Gear Box Train: 6 to 1 gear ratio to two flex shaft outlets: one 1/4" flex shaft included. Unit includes 8 gears and 7 precision bearings. Many other gear ratios possible. Wt. 10 lbs. PPD! **$8.49**

2 H. P. MOTOR 24-volt, 90-amp, double end ball-bearing shaft. Wt. 18 lbs. F.O.B. Tulsa, only..... **$7.00**



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●2—8" WIRE WHEELS coarse and fine, 5/16" thick, 5/8" bore, pair only	$2.29
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Money Back Guarantee — All Mdse. Mixture of New and Reconditioned Unless Specified New. ALL ITEMS (EXCEPT THOSE SPECIFIED POST PAID) WILL BE SHIPPED F. O. B. TULSA — OR, ADD 10% AND WE WILL SHIP YOUR MDSE. PPD.

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SAVE YOUR CAR—IT MAY HAVE TO LAST A LONG TIME

Mechanics agree that most engine wear occurs because oil drains into the crankcase during stops This gives acids a chance to attack unprotected metal and is the cause of DRY STARTING* which wears out engines . . . leads to costly repairs.

To prevent "Engine Ulcers," use Miracle Power in gas and oil. Miracle Power contains colloidal synthetic graphite in suspension. This graphite clings to metal . . . holds oil . . . lubricates parts even if oil is absent . . . protects them against DRY STARTING and acid etching. And you save gas and oil because better lubricated parts waste less power.

Try Miracle Power next time you get gas.

Miracle Power Division
THE AP PARTS CORPORATION
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THE AP PARTS CORPORATION
860 AP Building, Toledo 1, Ohio

Enclosed find $_____ for which please send me *postpaid:*
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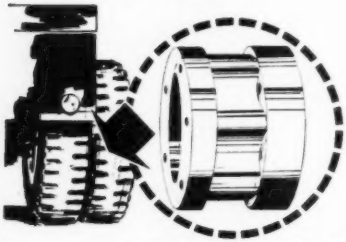
☐ Please send me free literature on making my car last longer.

Name_____
Address_____
City_____ Zone_____ State_____

At gas stations, garages, Kaiser-Frazer, Ford and other car dealers or use this coupon for introductory offer.

Jeep Owners Attention!

HICKEY Dual Wheel Adaptor Spools Add 4 TIMES the Traction



They give you the "go" you need in snow, mud, slush and sand. Your Jeep pulls like a bulldozer. Spools made of heat-treated aluminum alloy for strength, durability and light weight. Installed in less than 5 minutes with use of ordinary lug wrench. Fits all Jeeps, Fords and any vehicle having 5-bolt wheel with 5½ inch bolt circle. Bolts are of heat-treated steel. Need for tire chains eliminated. A "must" for hunters, fishermen—ranchers . . . wherever the going is rough . . . . . **$35.00** per pair

(add $2.80 excise tax and sales tax, if any)

Mfgrs. of the HICKEY HEAD for power plus!

Send for illustrated descriptive literature

HICKEY ENTERPRISES

10827-A Wright Road • South Gate, California

44,000 Storms a Day Breed Lightning

[*Continued from page 135*]

tremendous quantities of water—perhaps as much as 300,000 tons—in the form of raindrops, snowflakes or hailstones."

This much is known for sure, because Dr. Byers and others have flown F-61C "Black Widow" fighter planes loaded with equipment into the wildly beating hearts of thunderstorms. But from here on, scientific speculation takes over. It is generally accepted, however, that great negative charges of electricity accumulate near the bottom of thunderclouds. On the earth, meanwhile, positive charges are accumulating and follow the cloud along like a swarm of bees—up trees, church steeples and chimneys—attracted by the pull of the negative charges in the cloud.

Lightning Strikes Up

"When this tension between positive and negative becomes strong enough," says Dr. Byers, "the cloud puts out an invisible 'leader' stroke to explore the path of least resistance to the ground. Once this contact is made, a brilliant lightning flash jumps upward from earth to cloud (it only *seems* to jump in the other direction) at a speed of 22,000,000 miles per hour."

Lightning can be "hot" or "cold." The cold variety is as explosive as dynamite, but flashes so quickly—in less than 1/10,000 of a second—that it doesn't have time even to scorch. Hot lightning maintains its electric fire from 100 to 1,000 times as long and actually burns whatever it hits. Sometimes its temperatures reach 27,000°, considerably hotter than the surface of the sun.

Cold Lightning Explodes

Cold lightning will explode a haystack, a tree or a house, whereas hot lightning will set it on fire. Cold lightning will rip and shred cloth; hot lightning starts it burning.

The air along the path of a lightning bolt expands enormously. The core of this path is about the size of your finger, but in a flash explodes into a column of fire as big as the calf of your leg. As this heated air cools and shrinks, other air rushes into the space and this sequence of events makes the noise we call thunder. You can calculate how far away lightning has struck by timing the lapse between flash and thunderclap. Since sound travels about a mile in five seconds, a 10-second gap, for instance, means two

[*Continued on Page 234*]

5 BIG POWER TOOLS in ONE

RETAIL PRICE $125.00

FACTORY TO YOU $79.95

SUPERSHOP is a PRECISION-BUILT WORKSHOP. 100% ball bearing. **All** running parts precision **ground.** Big capacity. Extra rugged. Amazing **value.** **Write for FREE catalog.**

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Speed Way Speed Sander

SANDS, SMOOTHS, CLEANS, BUFFS, POLISHES

This motor-driven, all-ball-bearing, orbital motion finishing sander works any wet or dry abrasive—3 covers from standard sandpaper sheet makes it easy to finish or refinish furniture, woodwork, walls. Ask your dealer to demonstrate. **Write for electric tool catalog.**

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Send for free illustrated 24-page booklet—tells how to buy and apply right aluminum paint for all jobs around the house. We don't make paint, but prepared this booklet to help you get better results with aluminum paint. Write for free book "Paint it Bright".

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Make lasting Metal Repairs

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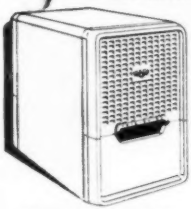
KEEP YOUR TOOLS FREE FROM RUST!

THE FRIGIDAIRE ELECTRIC DEHUMIDIFIER
ends moisture damage in Workshops, Basements, Darkrooms



Compact size—put it anywhere—18¼" high—20½" long—11¾" wide

Put a permanent end to moisture damage the instant you plug in this amazing device. Stops mold, rust, mildew. Protects equipment, luggage, furniture. Positively controls moisture in any closed area up to 8,000 cubic feet. No messy chemicals to bother with. Operates on pennies a day. Uses refrigeration principle. Powered by world-famous Frigidaire Meter-Miser compressor with 5-Year Protection Plan. See your Frigidaire Dealer or write for special folder giving full details. Frigidaire Division, General Motors Corp., 1530 Amelia St., Dayton 1, O.

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FASTEST MOST POWERFUL TOOL In Its Class—Approx. 27,000 R. P. M.

Most practical tool a man can own—more powerful than any similar tool you can buy. Works well in wood, plastics, and metal. For home maintenance jobs you'll wonder how you got along without it. For model making it's a **must.** And for general shop operations it saves time and money. Compare it, try it, buy it. You be the judge.

Check These Important Features—Oilless sealed bearings • Dynamically balanced armature • Shockproof, Bakelite housing • Dust-filtered air cooling system • Sturdy 110-120 V., A.C.-D.C. motor • Wt. only 13 oz. • a precision tool widely used in industry for many years.

MOTO-TOOL No. 2 (with 1 emery wheel point) **$16.50**

MOTO-TOOL KIT No. 2
With 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishers) **$23.50**

WHERE TO BUY MOTO-TOOL: If your dealer cannot supply you, send remittance in full for postpaid shipment. Or, send only $2; pay postman balance plus postage and C.O.D. fee. **Money back if not delighted after 5 days' trial.**

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For Better Work—FASTER—EASIER

THE ZEPHYR Electric Drill

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Handy . . . Speedy . . . Powerful. Has many uses around the home . . . in the shop . . . on the farm. Built to Last. Full ¼" Capacity.

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Horizontal Drill Stand—for Polishing, Buffing, Grinding, etc.

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Includes above ZEPHYR Drill, plus 28 accessories for buffing, cleaning, drilling, grinding, mixing paint, polishing, sanding, sharpening, waxing, and wire brushing.

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Brings 'split-second' starting to ANY CAR or TRUCK

STEWART-WARNER *Electric* **fuel pump**

Get yours now! Get quick, sure "split second" starts for your car or truck—every time—in any weather! This Stewart-Warner *Electric* Fuel Pump feeds a steady flow of fuel to your carburetor the *second* you turn on the ignition. Operates independently of the engine. Saves your battery. Saves you from the trouble and embarrassment of a car that dies at every stop.

Easy to Install. Takes only minutes. Do it yourself or see your local Carburetor Shop or Service Garage.

Precision Built by

STEWART-WARNER

Instrument Division, Dept. P-82
1840 Diversey Parkway • Chicago 14, Ill.

44,000 Storms a Day Breed Lightning

[*Continued from page 232*]

miles between you and the lightning bolt.

For several years big electric-equipment manufacturing companies and a number of universities have been conducting extensive research programs to find better ways of guarding against the 70,000 bolts that hit U. S. power lines every year. For when electric power is knocked out, home, office, factory and hospital are paralyzed.

The Westinghouse company has hundreds of lightning traps in 20 states. One of the most elaborate is on the roof of the University of Pittsburgh's Cathedral of Learning, 535 feet above the ground. Here lightning is snared on a 50-foot steel mast and channeled through various protective devices to test their efficiency. Six specially developed instruments record its current, wave shape, duration and number of strokes.

One Jolt Had 345,000 Amperes

It was here in 1947 that Westinghouse engineers trapped a super lightning bolt, thought to be the largest ever recorded. It consisted of five separate surges, at least one of which contained an estimated 345,000 amperes of electricity—enough to light all the reading lamps and street lights in a city the size of San Francisco for the duration of the flash.

General Electric has set up a similar lightning trap on the Empire State Building in New York City. This building draws as many as 48 bolts a season and once was struck by 19 during a single storm.

But scientists don't rely entirely upon unpredictable natural lightning for their research. They also manufacture their own, with huge lightning guns which toss 1,000,000- to 15,000,000-volt charges at all manner of targets but especially generators, transmission poles and insulators.

The studies have paid off. Protective devices have been developed, some no larger than a pack of cigarettes, some 12-ton circuit breakers. As a result the odds today are 99 to 1 that a direct hit by lightning anywhere along our 85,000 miles of transmission lines will not cause a second's loss of service.

It would be pleasant if the lightning hazards to human beings could be reduced with the same efficiency and dispatch. Actually, the safest place to be during a thunderstorm is where most of us will

[*Continued on page 236*]

STOPS LEAKS PERMANENTLY

Cut your fixture replacement, water and fuel bills with Economy Renewable Seats. Make economical, permanent repairs quickly and easily with the Junior Kit (illus.). Repair bathroom, kitchen and laundry fixtures. Everything you need included in steel box. This is a natural for the "Fixit" shops—get extra income from making permanent repairs on your customers' faucets.

Senior Master Kit also available—repairs faucets and valves up to 1" pipe.

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JUNIOR KIT, only $22.50

with 15 assorted Renewable Seats "Less than the cost of a set of kitchen sink fixtures."

ECONOMY VALVE SEAT CO.

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WONDER-PASTE Paint Remover

The modern, easy way to strip paint, varnish, enamel, lacquer, etc. AT PAINT AND HARDWARE STORES

Write us for leaflet on Wonder-Paste

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Plow
Plant
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Mow
Rake
Cut Trees
Saw Wood

Walking or Riding Tractors

1½, 3, 5 H.P. walking models. 6, 8, 12 H.P. riding tractors. Get just the power you need in Shaw extra strength superior traction machines. All wanted tools, attachments. Dependable for nearly 50 years. See a Shaw dealer. Write for **FREE literature**, low prices—today.

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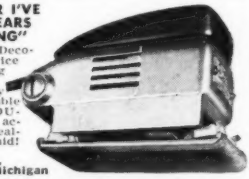
Follow Master Decorator Jokela's advice—get the amazing new "504" SYNCHRO — only sander with Double Arc Motion DOUBLING sanding action! $19.95 at dealers or postpaid! Circular Free.



Dept. G-92 Syncro Corp., Oxford, Michigan

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WITH A FUEL PRESSURE REGULATOR!

THIS REVOLUTIONARY NEW ACCESSORY STOPS GAS WASTE CAUSED BY FUEL PUMP PULSATION. ELIMINATES CARBURETOR FLOODING AND FUEL "SURGE." STOPS THE ANNOYANCE AND POWER LOSS CAUSED BY "MOTOR CUT-OUT." Many users claim up to 25% gas saved. Regulator s-m-o-o-t-h-s fuel flow...prevents vapor lock and percolating. It pays for itself in a few weeks with gas saved, by eliminating frequent carburetor cleaning and by reducing engine and carburetor wear. Fits all cars and trucks.

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3 BOOKS FREE! With each order: Big "Speed Equipment Catalog" plus "Economy Driving Manual" plus famous "150 Miles Per Gallon Book"—a regular $1.75 value free with order.

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HUNDREDS of SENSATIONAL BARGAINS!

HOT ROD SUPERCHARGER

Extra soup and go at a price you can't afford to miss! Mfr'd by Borg-Warner. Specifications: 7½" deep, 7" high. Wgt. 17 lbs. Compact and sturdy. 4 base mounting holes 3¼" outlet. ⅝" shaft with female Lovejoy coupling. Price today at $83. Our special SALE PRICE..... **$31.00**

TRACTOR SULKY for POWER MOWER

All steel, multi-purpose sulky. Soft riding tires, ball bearing wheels and adjustable bucket type seat for use with power mower. Can be used for hand-truck, wheelbarrow or outboard motor dolly—with seat off. Overall length 49", hgt. 33", wheel tread 24". Model A has 2.75x10 tires at **$22.50**; Model B 4.00x16 pneumatic tires at **$34.50.**

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ALARM HORNS and Sirens. 110v. AC motor driven (not a vibrator). Heavy duty with great power and long life. Adjustable tone—high, med. and low. For boats, school yards, factories, air raid siren, etc. Weatherproof. List $47. Our price NEW **$24.95**

AUTOMATIC ELECTRIC RAT TRAP

110v. with magnetic trap door. Tried and proven design—NEW on the market. Ends dead rat odor, takes up to 22 rats a night, galvanized..... **$24.95**

LIGHT PLANTS

300 Watt 110-220 volt AC. Wgt. 40 lbs.—portable **$99**
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5 KW Plant. 120 volts, 60 cycle AC. List today $1910.00. Used $675.00. NEW. Your price only

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Throw-Out Friction Disc Clutch

Twin disc, throw-out type. Ideal for power link with small gas engines and electric motors from ¾ to 15 HP. Available with shaft bores of: 1-7/16", 1⅜", 1¼", 1", ⅞" and ¾". (Specify size) Overall length 4", 5½" plate with six mounting holes. Wgt. 4 lbs. LISTS at $44. Used like new. Only **$15.95**

RUBBER HOSE

Long wearing GOODRICH 2 ply 2" I. D. 25 ft. lengths worth $25.00. Only. **$4.95**
3 lengths for..... **$12.00.**

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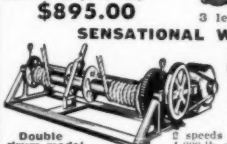

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1,000 lb. cap. Hand oper.. **$12.95** (ALSO AVAILABLE in models with 24-1, 54-1, and 80-1 ratios.)
Hand operated ball-bearing model. 1500 lb. cap. 3-1 ratio, hand brake. 2 speeds **$39.50**
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4,000 lb. electric drive...$188.50. Single drum, ¾" HP motor 110 or 220 AC. Start-stop-reverse switch. Ratio 12-1. NEW $125.00. Double drum model..... **$135.00**
CABLE, ¼" preformed stainless steel aircraft; 100 ft. or less, 17c per ft.; over 100 ft., 15c per ft.

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Hundreds of $5 saving buys. These are a few of the many items at sensationally low prices!

Pumps Grinders | Drop Cords Generators | Fire Pumps Saws | Clutches Air Tanks

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FILE SAWS THE RIGHT WAY

SO EASY to joint and file saws like new 2 hardened steel rollers keep teeth same height All teeth cut saw runs true and smooth **$2.95**

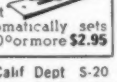
SUPER DRILL GRINDER

Sharpens round shank drills 3/32 to ½" 6 long Grinds old drills like new in 4 different point angles, using hand power grinders **$2.95**

At dealers or postpaid **FREE FOLDERS**

GRIND all circle saws 6 to 10" with correct beveled wheel Fits your saw table **$8.95**

TRU-CIRCLE Saw Set — Automatically sets teeth 10° or more **$2.95**



A. D. McBURNEY 317 E 4th St. Los Angeles 14 Calif Dept S-20

The NEW Model 50 UTILITY TESTER

FOR REPAIRING ALL ELECTRICAL APPLIANCES-MOTORS

an all-around electrical trouble shooter

- Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistances, etc.
- Will measure the current consumption while the appliance under test is in operation. The appliance or utility may be plugged directly into the front panel receptacle. A special pair of insulated clip-end leads is included for motors, etc.
- Incorporates a sensitive direct-reading resistance range which will accurately measure all resistances commonly used in electrical appliances, motors, etc. This range will enable continuity checks and tests for shorts and opens.
- Will test thermostats, radio tube filaments, bulbs, fuses, fluorescents, condensers, switches, field coils, circuit breakers, lighting systems, etc.

Handsome round cornered molded bakelite case 3¼" x 5⅞" x 2¼". Complete with all test leads and instructions.

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SHIPPED ON APPROVAL

No Money With Order — No C.O.D.

Try it for 10 days before you buy. If completely satisfied send $3.90 and pay balance at rate of $2.00 per month for 5 months —No Interest or Carrying Charges Added. If not completely satisfied, return to us, no explanation necessary.

SUPERIOR ELECTRONIC CO., INC.
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Please rush 1 Model 50. I agree to pay $3.90 within 10 days after receipt and $2.00 per month thereafter.
Name .....
Address .....
City ..... Zone ..... State .....

HANDYMAN'S BEST FRIEND

5 SAWS IN ONE

1—16" Hand Saw Blade. 1—14" Nail Cutting Saw Blade.
1—12" Back Saw Blade. 1—12" Key Hole Saw Blade.
1—16" Pruning Saw Blade. 1—Handle with Hardware.

$2.50 POSTPAID

R and L SALES
P. O. BOX 224 WAUWATOSA 13, WISC.

44,000 Storms a Day Breed Lightning

[*Continued from page 234*]

naturally be—in a building. The safest kind is a skyscraper; its steel frame conducts the lightning harmlessly into the ground.

On page 135 are eight safety rules offered by Dr. E. L. Harder, chief lightning engineer for Westinghouse. Better observe those rules. We can't all have the luck of Charles Brown of Kenton, Ohio, who has been struck by lightning 10 times.

"I've already used up one more life than a cat," he said when he came to after the tenth stroke. "I guess I'll have to be careful from now on." END

How Bad Are Our Roads?

[*Continued from page 69*]

local motorists. Therefore, there must still be parallel free roads. Since the highway user is, in effect, paying for both types of roads, he might better foot the bill in higher taxes and enable all roads to be "free."

A new movement is under way, however, to solve the whole mess without toll roads but with a fresh approach. The movement is called Project Adequate Roads, or PAR. PAR backers, a powerful group that includes leading car, car-parts and tire manufacturers, truckers, bus lines, cattlemen, the AAA, and gas and oil producers, believe that states should be prevented from diverting income from car-use taxes to purposes other than road building and maintenance. If all this tax money went where it should, they say, we could afford to improve our roads faster and on a broader scale.

Rating Highways Would Determine Needs

They also urge that state highway departments be required to make "sufficiency ratings" of every section of their main roads. The rating is based on three factors: safety, condition and the percentage of traffic served. The maximum rating is 100, and the extent to which each section of road falls below 100 in its sufficiency rating quickly shows how badly it needs attention.

The PAR people feel that this system will see to it that no highway funds are wasted on pet and sometimes impractical projects of political big-wigs.

In the Twenties, a nationwide movement to "get us out of the mud" resulted in building most of the miles of paved road now considered inadequate. PAR's slogan is "Get us out of the muddle!" END

WEATHER-PROOF YOUR CAR...

LIKE THE NEW

CADILLAC, FORD, HUDSON, CHRYSLER, Etc.

Drive thru rain, snow, puddles, protected by SEALTIGHTS—the original ignition weather-proofing insulators.

SEALTIGHT IGNITION INSULATORS

AMERICA'S FINEST INSULATORS!

Weatherproof, short-proof all cars, trucks, tractors, gas motors with Sealtights on spark plugs, distributor, coil, magneto. ASK YOUR GARAGE or SERVICE STATION, or write us for details, giving make and model of car.

SEALTIGHT CORP., Dept. PS82, Cedar Rapids, Iowa

MAGNETS LIFT 225 lbs.

GENUINE ALNICO—NEVER WEAKENS

AMAZING, PERMANENT MAGNETS—WILL NOT WEAKEN! NON-ELECTRIC

Retrieve guns, tackle, tools and other steel items from lake, river, plating tanks, drains or other hard-to-reach spots. Recover drills, taps, etc. from sweepings. Clear alley of harmful tacks, nails. Many other uses. Pays for itself quickly. GUARANTEED. Try any magnet one week. Money refunded if you are not well pleased.

No. S-725 (Weighs 54 oz.) Has pull of 225 lbs. on steel block $15.00
No. S-675 (Weighs 49 oz.) Has pull of 175 lbs. on steel block $10.50
No. S-650 (Weighs 41 oz.) Has pull of 150 lbs. on steel block $ 8.50
No. S-30 Hobbyist assortment of six small magnets..... $ 1.50
Send Money Order or check. We pay postage. No C.O.D.'s.

MIAMI MAGNET COMPANY, 3240 N.W. 27th Ave., Miami 42, Fla.

Extra big disc sander

COMPARE size, quality, features! 5-in-1 SHOPSMITH has 12" disc, large tilting table, miter gauge, rip fence. Converts to saw, lathe, vertical and horizontal drill. Write for FREE catalog.

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CASH IN YOUR SPARE TIME!

BIG MONEY IN OWN BUSINESS

YOU CAN MAKE UP TO $40 a DAY sharpening and setting circular saws for factories, builders, lumber yards—with NEW BELSAW COMPLETE CIRCULAR SAW SHOP. **Low Cost, only $15 down,** sharpens 4 to 5 saws an hour. *No experience needed!* Instructions Furnished. Send Postcard Today for FREE BOOK. ▶

LIFE-TIME SECURITY YOUR OWN BUSINESS

BELSAW MACHINERY CO. 4405 Field Bldg. Kansas City 2, Mo

Sand WITH YOUR TABLE SAW

8" ALUMINUM DOUBLE FACED SANDING DISC FITS YOUR SAW LIKE A BLADE — $4.95

½" to ¾" Arbor Size

CIRCULAR SAW ACCESSORIES

SAW BLADES — DADO HEADS
MOULDING CUTTERS
SANDPAPER DISCS & CEMENT
Write for Catalog S-8

JAXON COMPANY • BOX 142 • GASPORT, N. Y.

NEW AUTOMOTIVE DISCOVERY!

The Amazing NEW POLAR-VISION LIGHT

Actually SEE IN THE DARK!

STOP HEADLIGHT GLARE

STOP Windshield ICING and FOGGING too!

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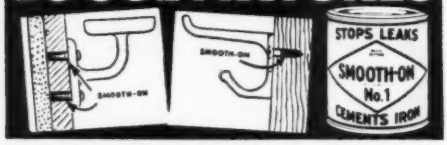

Smooth-On No. 1 Iron Cement applied to your loose hinges, door handles, coat hooks, drawer pulls, knobs, casters, bathroom fixtures, tool and cutlery handles, will tighten them and *keep* them tight. • Get Smooth-On No. 1 in 1¼ oz., 7 oz., 1 lb. or larger sizes at your hardware store. If they haven't it, write us.

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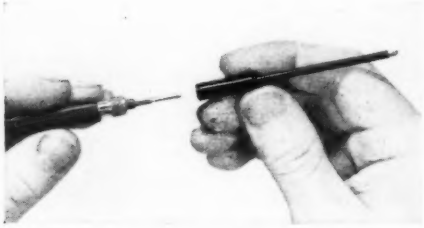

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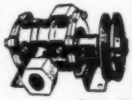

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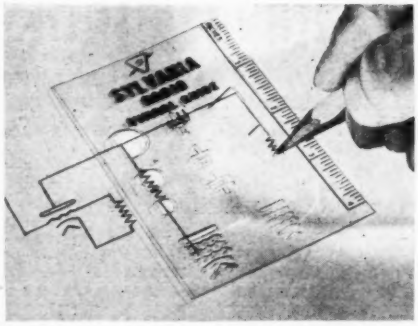

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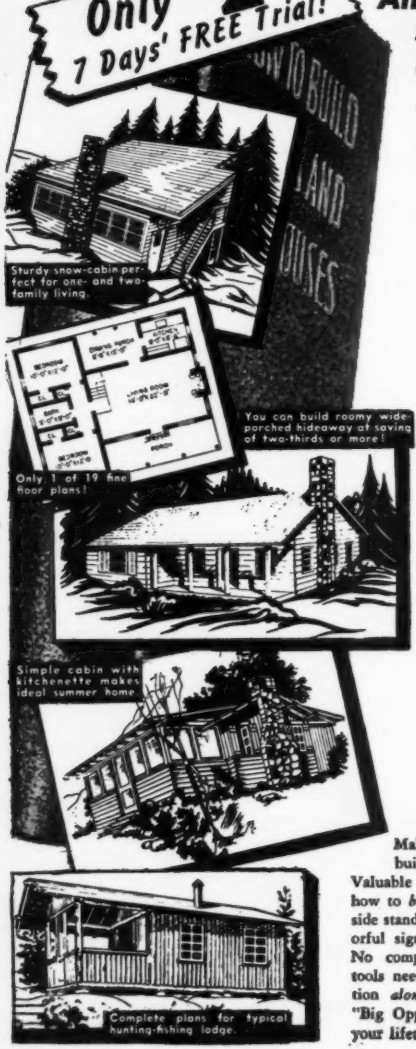

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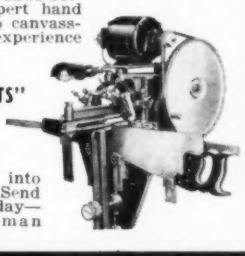

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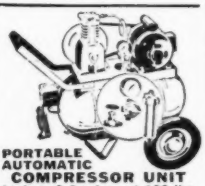

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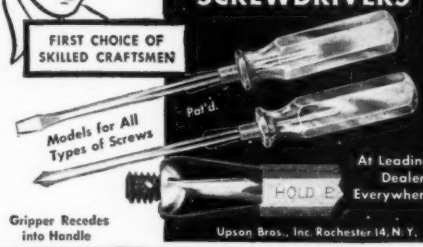

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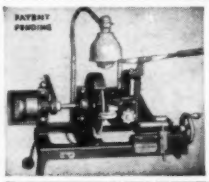

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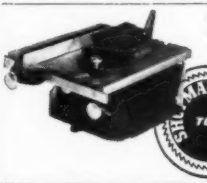

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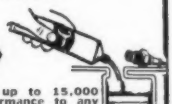

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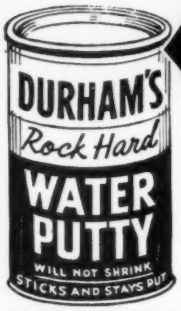

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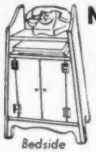

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They Hunt Rocks . . .

[*Continued from page 96*]

from Florida, petrified wood from Louisiana, granite from New York, amethyst from Rhode Island, and so on—and the parts fit together like pieces of a jigsaw puzzle.

Bert A. Rhoads of Lander, Wyo., wanted his grandson to be a rockhound, so he made him a jade teething ring. Harry R. Ringwald of Hollywood has made an agate bird with an emerald eye, an agate bear with a jet eye, and a jade dog with a tourmaline eye. And Mrs. Charles H. Hermann of Los Angeles has made corsages from gem stones, but the weight of these creations will probably prevent young rockhounds from sending them to their girls for senior proms.

Sometimes a rockhound must go it alone, with scant help from his family. He may tramp mile after mile through rough country where rattlesnakes claim priority, spend four days digging out a rare piece of quartz, and take it home only to be told: "Change your clothes in the basement, and don't bring that junk in here." But this is seldom discouraging to a man who is permitted to read the story of the ages, in full color, from the rocks he finds. END

Italian Sports Cars

[*Continued from page 78*]

best word for Italian engineering is *balance*. They shift a pound here and a pound there till a car is poised like a ballerina on one toe. Center of gravity is w-a-a-y down. Unsprung weight is kept to a minimum to reduce spring bounce. Extra-firm coil-spring front suspension with transverse stabilizer bars checks the sidesway on corners. Low over-all height, small frontal area and no unnecessary projections cut wind resistance to a minimum. Even the door handles are usually either flush-fitted or inside the car. Aluminum bodies and souped-up engines mean an exceptionally high horsepower-to-pound ratio, and that gives you terrific acceleration."

Von Freymann, who does a bit of road racing himself, grinned. "It all adds up to a car that's *fun* to drive—that's what your sports-car man is looking for above everything else."

One feature he didn't mention: these Italian speedsters draw the eye like Esther Williams in her working clothes. Race driver Luigi Chinetti, who teamed with Piero Taruffi to win the Mexican race last November, took us for a spin through Manhattan's Central Park the other day in his scarlet Le Mans model 1952 Ferrari (at this writing, the only one in the U. S.). When he rolled to a stop near the boat pond with a final thunderous blat from twin exhausts, a curious crowd seemed to rise right up out of the ground.

Standing starry-eyed before $13,000 worth of fire-engine-red Ferrari, 14-year-old Leroy Rudewicz of The Bronx, N. Y., delivered the majority opinion. "Boy oh boy," he whispered in awe-struck tones, "what a bucket o' bolts!" END

Rain Made to Order for Television Shows

RAIN for NBC television shows comes in three sizes—small, synthetic and wet.

For a small shower, a garden watering can is emptied just in front of a camera.

Synthetic rain is made with glammé, a cellophane-like plastic that is woven into a cloth. A strip of it is attached to a drum and rapidly revolved. One camera shoots the actual scene, the other shoots the revolving glammé—and the superimposed images make it rain.

Wet rain, on a 12- by 24-foot scale, is produced by soaker hoses of unimpregnated canvas that are held above the scene to be televised. Water, exuded through the pores of the canvas, falls into a tank under the floor boards on which the actors stand, and is pumped out as fast as it drops. The tank is acoustically treated with excelsior or glass wool to avoid noisy "plops" which would rob the scene of conviction. This is the most effective of all rains.

What about snow? Falling snow can be a plastic spray, bleached corn flakes (a Hollywood stand-by that's a little noisy for television), confetti (very convincing except that it doesn't melt indoors), or powdered ice (it melts, but the mechanical system needed is too noisy). NBC is currently working on a secret device which will create a synthetic snowfall that a viewer won't be able to tell from the real thing.

For a dressing of snow, James Glenn, head of the special-effects department, finds that powdered gypsum, marble dust and dairy salt are all good—the latter especially for snowbanks or window ledges. The salt is piled up and then lightly sprayed with water to give it a crusty, frozen look.

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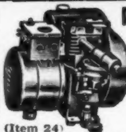
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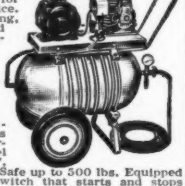

(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing, and the hundreds of other jobs done by compressed air. Piston type. 2"x2" compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Stainless steel tank, 12" x 24", 2100 cu. in. cap. Safe up to 500 lbs. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Note low factory prices.
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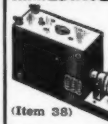
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Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¾" plate using ¼" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs. $400 value at.. **$99.75**
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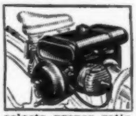

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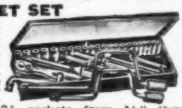

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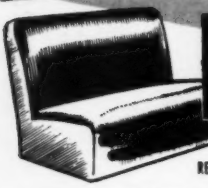

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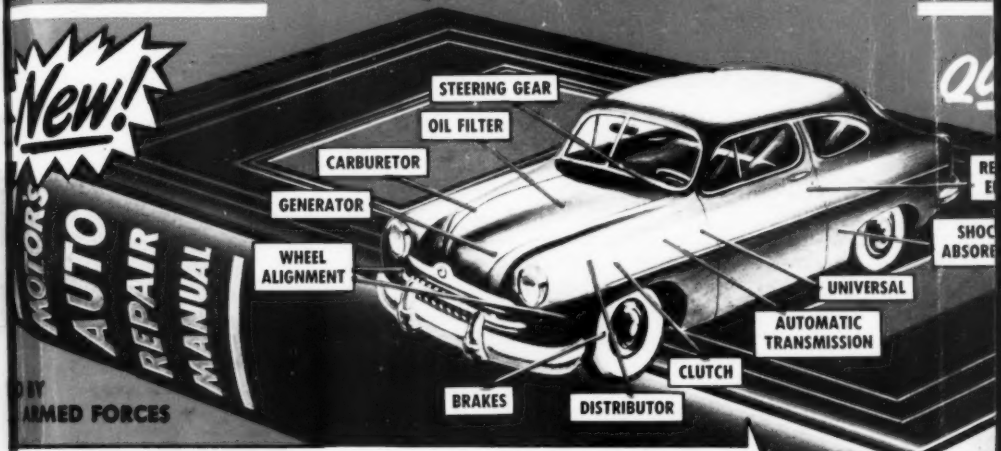

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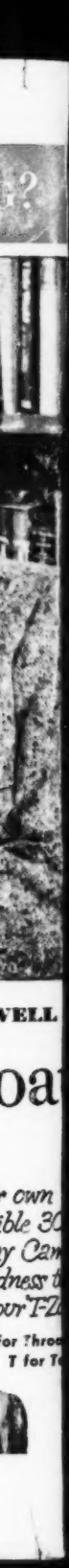
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